Change History

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430-94031-001 (Rev. 9/94)	Original issue		

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Section 1

INTRODUCTION

The Plum® XL3™ Multi-Line Infusion System, herein referred to as the XL3 infusion system, is designed to meet the growing demand for hospital-wide device standardization. The XL3 infusion system consists of three component pumps designated line A, line B, and line C. By incorporating three lines into one unit, the XL3 infusion system provides three primary lines, three secondary lines, and piggyback fluid delivery capabilities. The XL3 infusion system serves a wide range of general floor, critical care, and home care needs. Compatibility with LifeCare® 5000 PlumSet® administration sets and accessories make the XL3 infusion system convenient and cost-effective.

1.1 SCOPE

This manual is organized into 11 sections:

- ❑ Section 1 Introduction
- ❑ Section 2 Warranty
- ❑ Section 3 System Operating Manual
- ❑ Section 4 Theory of Operation
- ❑ Section 5 Maintenance and Service Tests
- ❑ Section 6 Troubleshooting
- ❑ Section 7 Replaceable Parts and Repair
- ❑ Section 8 Specifications
- ❑ Section 9 Drawings
- ❑ Index
- ❑ Technical Service Bulletins

If a problem in infusion system operation cannot be resolved using the information in this manual, contact Abbott Laboratories Technical Support Operations (*see Section 6.1, Technical Assistance*). The *Plum XL3™ Multi-Line Infusion System System Operating Manual*, herein referred to as the system operating manual, contains specific instructions for operating the XL3 infusion system. Provision is made for inclusion of the system operating manual in *Section 3* of this manual.

Note: Figures are rendered as graphic representations to approximate actual product; therefore, figures may not exactly reflect the product. Display screens and touchswitch labels may vary slightly, depending on the configuration of the infusion system in use.

1.2
CONVENTIONS

The conventions listed in *Table 1-1, Conventions*, are used throughout this manual.

Table 1-1. Conventions

CONVENTION	APPLICATION	EXAMPLE
Italic	References (section, figure, table)	*(see Figure 5.2, Distal Occlusion Test Setup)*
[ALL CAPS]	In-text references to keys are described in all caps and enclosed in brackets	[TITRATE]
ALL CAPS	Screen displays	DOOR/CASSETTE
ALL CAPS	Rotary control knob settings	OFF CHARGE
Bold	Emphasis	**CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface**

Throughout this manual, warnings, cautions, and notes are used to emphasize important information as follows:

WARNING

A WARNING CONTAINS SPECIAL SAFETY EMPHASIS AND MUST BE OBSERVED AT ALL TIMES. FAILURE TO OBSERVE A WARNING IS POTENTIALLY LIFE THREATENING.

CAUTION: A CAUTION usually appears in front of a procedure or statement. It contains information that could prevent irreversible equipment damage or failure.

Note: A note highlights information that helps explain a concept or a procedure.

1.3
ACRONYMS AND ABBREVIATIONS

Acronyms and abbreviations used in this manual are as follows:

A Ampere

AC	Alternating current
AC RMS	AC root-mean-square
A/D	Analog-to-digital
BAT2	Battery 2
CHRG_OFF	Charge off
CMOS	Complementary metal-oxide semiconductor
dB	Decibel
DIST_AIR_EN	Distal air enable
DISTPRES	Distal pressure
DMM	Digital multimeter
ECG	Electrocardiograph
EEG	Electroencephalograph
EEPROM	Electrically erasable programmable read-only memory
EL	Electroluminescent
EMG	Electromyograph
EMI	Electromagnetic interface
ETO	Ethylene oxide
HKDC	Housekeeping DC
IC	Integrated circuit
IPB	Illustrated parts breakdown
IV	Intravenous
kHz	Kilohertz
LCD	Liquid crystal display
LED	Light emitting diode
LOCHG	Low charge
LOCHG_REQ	Low charge request
MCU	Micro controller unit
MHz	Megahertz
MOSFET	Metal-oxide semiconductor field-effect transistor
MOTIO_EN	Motor input/output enable
MOTPHAS1	Motor phase 1
MOTPHAS2	Motor phase 2
MOTPLN_EN	Motor plunger enable
MOTPS_EN	Motor primary/secondary enable
mV	Millivolt
OSHA	Occupational Safety and Health Administration
NRTL	Nationally Recognized Test Laboratories
PLL	Phase-lock loop

POWERHOLDA	Line A power hold
POWERHOLDB	Line B power hold
POWERHOLDC	Line C power hold
PROX_AIR_EN	Proximal air enable
PVT	Performance verification test
PWA	Printed wiring assembly
ROT0	Rotary 0
ROT1	Rotary 1
ROT2	Rotary 2
SPSTINA	Line A single-pole, single-throw in
SPSTINB	Line B single-pole, single-throw in
SPSTINC	Line C single-pole, single-throw in
VCO	Voltage-controlled oscillator
VDIGA	Line A digital voltage
VDIGB	Line B digital voltage
VDIGC	Line C digital voltage
VMOTA	Line A motor voltage
VMOTB	Line B motor voltage
VMOTC	Line C motor voltage
Vpp	Voltage peak-to-peak
VTBI	Volume to be infused
W	Watt
µA	Microampere
µL	Microliter
µs	Microsecond

1.4
USER QUALIFICATION

The XL3 infusion system is for use at the direction or under the supervision of licensed physicians or by licensed or certified healthcare professionals who are trained in the use of the XL3 infusion system and the administration of intravenous (IV) fluids.

1.5
ARTIFACTS

Nonhazardous, low-level electrical potentials are commonly observed when fluids are administered using infusion devices. These potentials are well within accepted safety standards, but may create artifacts on voltage-sensing equipment such as ECG, EMG, and EEG machines. These artifacts vary at a rate that is associated with the infusion rate. If

the monitoring machine is not operating correctly or has loose or defective connections to its sensing electrodes, these artifacts may be accentuated so as to simulate actual physiological signals. To determine if the abnormality in the monitoring equipment is caused by the infuser instead of some other source in the environment, set the infuser so that it is temporarily not delivering fluid. Disappearance of the abnormality indicates that it was probably caused by electronic noise generated by the infuser. Proper setup and maintenance of the monitoring equipment should eliminate the artifact. Refer to the appropriate monitoring system documentation for setup and maintenance instructions.

1.6 INSTRUMENT INSTALLATION PROCEDURE

CAUTION: XL3 infusion system damage may occur unless proper care is exercised during product unpacking, inspection, and self test.

The XL3 infusion system installation procedure consists of unpacking, inspection, and self test.

Note: Do not place the XL3 infusion system in service if the battery is not fully charged. To make certain the battery is fully charged, connect the XL3 infusion system to AC (mains) power for eight hours.

1.6.1 UNPACKING

Inspect the XL3 infusion system shipping container as detailed in *Section 1.6.2, Inspection.* Use care when unpacking the XL3 infusion system. Retain the packing slip and save all packing material in the event it is necessary to return the XL3 infusion system to the factory. Verify that the shipping container contains a copy of the XL3 infusion system system operating manual.

1.6.2 INSPECTION

Inspect the XL3 infusion system packing container for shipping damage. Should any damage be found, contact the delivering carrier immediately.

Inspect the XL3 infusion system for evidence of damage. Do not use the XL3 infusion system if it appears to be damaged. Should damage be found, contact Abbott Laboratories *(see Section 6.1, Technical Assistance).*

Inspect the XL3 infusion system periodically for signs of defects such as worn accessories, broken connections, or damaged cable assemblies. Also inspect the XL3 infusion system after repair or during cleaning. Replace any damaged or defective external parts.

1.6.3
SELF TEST

CAUTION: Do not place the XL3 infusion system in service if the self test fails.

Note: When performing the self test, line A, line B, and line C must be tested; however, the self test may be performed on all lines concurrently. The self test requires approximately four seconds to complete.

To perform the self test, proceed as follows:

1. Connect the XL3 infusion system AC (mains) power cord to a grounded AC (mains) outlet and confirm the AC (mains) power icon (next to the OFF CHARGE setting) illuminates.
2. Lift up on the cassette door handle for line A to open the door assembly.
3. Hold a primed cassette by its handle and insert it into the cassette door guides. Do not force the cassette. Close the cassette door handle to lock the cassette in place.
4. Turn the rotary control knob to SET RATE to initiate the self test.
5. Refer to *Figure 1-1, LCD Test Screen.* Verify the following screens display: the LCD test screen; four backward Cs (approximately two seconds); set rate screen. Verify the LCD screen backlight is illuminated and the screen is clearly readable at eye level from approximately three feet.

   Note: If the LCD test screen does not match *Figure 1-1* exactly, contact Abbott Laboratories.

   Note: If an alarm condition occurs during the self test, turn the rotary control knob to OFF CHARGE and go to *Step 4.* If the alarm condition recurs, note the message and take corrective action (see Section 6, *Troubleshooting*). Repeat the self test. If the alarm condition recurs, remove the XL3 infusion system from service and contact Abbott Laboratories.

6. Listen for motor movement to confirm the cassette and valves are operating.
7. Disconnect the XL3 infusion system from AC (mains) power and confirm BATTERY displays on the LCD screen.
8. Turn the rotary control knob to OFF CHARGE and remove the administration set.
9. Repeat Steps 2 through 8 for line B and line C.
10. Connect the XL3 infusion system to AC (mains) power for a minimum of eight hours in the OFF CHARGE position to allow the battery to charge fully.

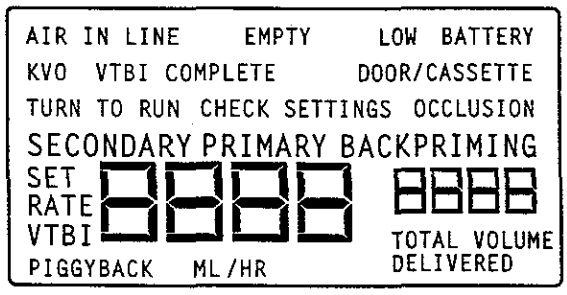

Figure 1-1. LCD Test Screen

XL 3

Section 5

MAINTENANCE AND SERVICE TESTS

This section contains preventive maintenance information, a performance verification test (PVT), and battery maintenance information for the XL3 infusion system.

5.1 PREVENTIVE MAINTENANCE

A preventive maintenance program promotes infusion system longevity and trouble-free operation. Such a program should include periodic XL3 infusion system inspection, exterior cleaning, and sanitizing. Verification of proper XL3 infusion system operation should also be included by periodically performing the PVT in *Section 5.2*.

As a minimum requirement, clean the XL3 infusion system after each use. Establish a regular cleaning schedule during use. In addition, inspect, clean, sanitize, and perform the PVT as part of any scheduled infusion system service or after any XL3 infusion system repair procedure unless otherwise indicated.

5.1.1 INSPECTING THE XL3 INFUSION SYSTEM

Inspect the XL3 infusion system periodically for signs of defects such as worn accessories, broken instrument connections, or damaged cables. In addition, inspect the XL3 infusion system after repairing or during cleaning. Replace any damaged or defective external parts.

Inspect the following areas for missing or damaged parts and for cosmetic defects:

- ❑ Labels
- ❑ AC power cord
- ❑ Rubber foot pads
- ❑ Door assemblies (cassette doors), shields, and handles
- ❑ Cassette guide springs and rollers
- ❑ Valve pins, plungers, bubble detectors, and locator pins
- ❑ Front panel labels
- ❑ Keypad switches
- ❑ Rotary control knobs and all external screws
- ❑ Pole clamp knob/shaft, extrusion, and tip insert
- ❑ Front and rear enclosures
- ❑ Battery access cover
- ❑ LCD screens

5.1.2

CLEANING THE XL3 INFUSION SYSTEM

The following procedures are designed to maintain the XL3 infusion system, sustain XL3 infusion system longevity, and promote trouble-free operation.

Follow hospital protocol for establishing a cleaning schedule.

WARNING

DISCONNECT THE XL3 INFUSION SYSTEM FROM AC (MAINS) POWER PRIOR TO CLEANING. FAILURE TO COMPLY WITH THIS WARNING COULD RESULT IN ELECTRICAL SHOCK.

CAUTION: Do not immerse the XL3 infusion system in liquids. Do not allow liquids to enter the electronics compartment.

CAUTION: Certain cleaning and sanitizing compounds may slowly degrade components made from some plastic materials. Using abrasive cleaners or cleaning solutions not recommended by Abbott Laboratories may result in product damage. Do not use compounds containing combinations of isopropyl alcohol and dimethyl benzyl ammonium chloride.

Clean the exposed surfaces of the XL3 infusion system with a soft, lint-free cloth dampened with one of the cleaning solutions listed in *Table 5-1, Cleaning Solutions*, or a mild solution of soapy water. Remove soap residue with clear water. Do not use solvents that are harmful to plastic, such as isopropyl alcohol or acetone. Do not use abrasive cleaners.

Table 5-1. Cleaning Solutions

Cleaning Solution	Manufacturer	Preparation
Vesphene® II se	Calgon Vestal Laboratories	Per manufacturer's recommendation
Manu-Klenz®	Calgon Vestal Laboratories	Per manufacturer's recommendation
Formula C™	Diversey Corporation	Per manufacturer's recommendation
Cidex®	Arbrook Laboratories	Per manufacturer's recommendation
Super Edisonite®	S. M. Edison Chemical Co.	Per manufacturer's recommendation
Household bleach	Various	One part bleach in four parts water

5.1.3

SANITIZING THE XL3 INFUSION SYSTEM

Sanitize external surfaces of the XL3 infusion system using a cleaning solution listed in *Table 5-1, Cleaning Solutions.*

Note: Not all cleaning solutions are sanitizers. Check product labeling.

CAUTION: Do not sterilize the XL3 infusion system using heat, steam, ethylene oxide (ETO), or radiation. These methods may cause the equipment to malfunction.

5.2

PERFORMANCE VERIFICATION TEST

As part of a preventive maintenance schedule, it is recommended that the performance verification test (PVT) be conducted periodically per hospital procedures for compliance to accreditation requirements.

The PVT is used for overall verification of XL3 infusion system performance and as a diagnostic tool during XL3 infusion system troubleshooting. The PVT consists of the tests described in the following sections. The PVT can be used for diagnostic purposes during the troubleshooting of a malfunctioning XL3 infusion system, and for verification of the overall performance as part of preventive maintenance schedule. In addition, the PVT should be used for performance verification before an XL3 infusion system is placed back in service after repair. If any malfunction is detected as a result of the PVT, refer to *Table 6-4, Troubleshooting with the PVT.*

Note: The PVT must be performed exactly as described in this manual to assure effective and reliable product evaluation information.

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

5.2.1

EQUIPMENT REQUIRED

The following equipment, or equivalents, are required to execute the PVT:

- ❑ Graduated cylinder, 25 mL, with 0.2-mL graduations (Type A)
- ❑ Sterile water in two IV bags/containers
- ❑ Pressure meter, Bio-Tek® DPM II
- ❑ Safety analyzer, Dynatech Nevada® 231D
- ❑ Three-way stopcock, List No. 3233-01 or 3232-01
- ❑ Special cassette, List No. 96-4270, with proximal bubble sensor tips removed from cassette, and marked EMPTY on the cassette
- ❑ Special cassette, List No. 96-4270, with distal bubble sensor tips removed, and marked AIR on the cassette
- ❑ IV set, List No. 6426-02

- ❑ IV set, List No. 3047-01
- ❑ Digital multimeter (DMM), Fluke® 8012A
- ❑ Syringe, capable of 20-mL capacity
- ❑ 21-gauge needle, List No. 4492
- ❑ Battery charger test box (P/N 595-88728-001)

5.2.2

INSPECTION

Before starting the PVT, thoroughly inspect the XL3 infusion system as described in *Section 5.1.1, Inspecting the XL3 Infusion System.*

5.2.3

XL3 INFUSION SYSTEM TEST SETUP

WARNING

DO NOT CONNECT THE XL3 INFUSION SYSTEM TO A PATIENT DURING TESTING.

To set up the XL3 infusion system for the PVT, proceed as follows:

1. Confirm the XL3 infusion system and appropriate accessories are fully assembled.
2. Hang two sterile water containers at a height of 18 to 24 inches (46 to 60 cm) above the XL3 infusion system.
3. Connect the XL3 infusion system to AC (mains) power. Conduct all tests with the XL3 infusion system connected to AC (mains) power unless otherwise specified.

5.2.4

SELF TEST

CAUTION: Do not place the XL3 infusion system in service if the self test fails.

Note: When performing the self test, line A, line B, and line C must be tested; however, the self test may be performed on all lines concurrently. The self test requires approximately four seconds to complete.

To perform the self test, proceed as follows:

1. Connect the XL3 infusion system AC (mains) power cord to a grounded AC (mains) outlet and confirm the AC (mains) power icon (next to the OFF CHARGE setting) illuminates.
2. Lift up on the cassette door handle for line A to open the door assembly.
3. Hold a primed cassette by its handle and insert it into the cassette door guides. Do not force the cassette. Close the cassette door handle to lock the cassette in place.
4. Turn the rotary control knob to SET RATE to initiate the self test.

5. Refer to *Figure 1-1, LCD Test Screen.* Verify the following screens display: the LCD test screen; four backward Cs (approximately two seconds); set rate screen. Verify the LCD screen backlight is illuminated and the screen is clearly readable at eye level from approximately three feet.

   Note: If the LCD test screen does not match *Figure 1-1* exactly, contact Abbott Laboratories.

   Note: If an alarm condition occurs during the self test, turn the rotary control knob to OFF CHARGE and go to *Step 4.* If the alarm condition recurs, note the message and take corrective action (*see Section 6, Troubleshooting*). Repeat the self test. If the alarm condition recurs, remove the XL3 infusion system from service and contact Abbott Laboratories.

6. Listen for motor movement to confirm the cassette and valves are operating.
7. Disconnect the XL3 infusion system from AC (mains) power and confirm BATTERY displays on the LCD screen.
8. Turn the rotary control knob to OFF CHARGE and remove the administration set.
9. Repeat Steps 2 through 8 for line B and line C.
10. Connect the XL3 infusion system to AC (mains) power for a minimum of eight hours in the OFF CHARGE position to allow the battery to charge fully.

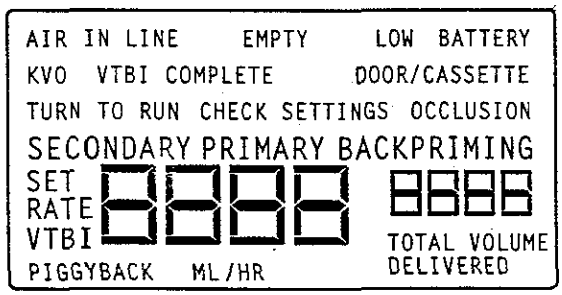

Figure 5-1. LCD Test Screen

5.2.5
KEYPAD AND ROTARY CONTROL KNOB TEST

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

To perform the keypad and rotary control knob test, proceed as follows:

1. Turn the rotary control knob on line A to SET RATE. Press the following keys to verify that each key activates and the screen responds: [PRI/SEC] toggles screen between PRIMARY and SECONDARY; [↑] raises the delivery rate value; [↓] lowers the delivery rate value.
2. Turn the rotary control knob to SET VTBI. Press the following keys to verify that each key activates and the screen responds: [↑] raises the volume delivered value; [↓] lowers the volume delivered value.

3. Turn the rotary control knob to RUN. Press and hold each key combination simultaneously to verify that each key combination activates and the screen responds: [TITRATE] and [↑] raise the delivery rate value; [TITRATE] and [↓] lower the delivery rate value.
4. Turn the rotary control knob to HOLD/RESET. Press and hold [BACK PRIME]. Verify pumping from the primary line through the secondary inlet port.
5. Repeat Steps 1 through 4 for line B and line C.

5.2.6

OPEN DOOR ALARM TEST

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

To perform the open door alarm test, proceed as follows:

1. Close the clamp on the line A secondary line to keep fluid in containers from mixing.
2. Open the cassette door. Verify DOOR/CASSETTE is displayed on the LCD screen and an alarm sounds.
3. Press [SILENCE]. Verify the alarm mutes.
4. Close the cassette door and unclamp the secondary line.
5. Repeat Steps 1 through 4 for line B and line C.

5.2.7

ALARM LEVEL TEST

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

To perform the alarm level test, proceed as follows:

1. Turn the rotary control knob on line A to SET RATE and open the cassette door. Verify DOOR/CASSETTE is displayed on the LCD screen and an alarm sounds.
2. Toggle the audio switch (located on the XL3 infusion system bottom) between high and low settings. Verify two alarm levels sound.
3. Press [SILENCE]. Verify the alarm mutes.
4. Close the cassette door.
5. Repeat Steps 1 through 4 for line B and line C.

5.2.8
FREE FLOW TEST

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

To perform the free flow test, proceed as follows:

1. Verify the installed cassette on line A is fully primed.
2. Turn the rotary control knob to SET RATE.
3. With the cassette door closed, check the distal end of tubing for fluid flow. Verify minimal flow of fluid (a few drops maximum).
4. Open the cassette door and check the distal end of tubing for fluid flow. Verify minimal fluid flow (a few drops maximum).

   Note: A small amount of fluid may be expelled from the cassette when opening or closing the door.

5. Close the cassette door and check the distal end of tubing for fluid flow. Verify minimal flow of fluid (a few drops maximum).
6. Turn the rotary control knob to OFF CHARGE.
7. Repeat Steps 1 through 6 for line B and line C.

5.2.9
DISTAL OCCLUSION TEST

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

To perform the distal occlusion test, refer to *Figure 5.2, Distal Occlusion Test Setup,* then proceed as follows:

1. On line A, connect a 21-gauge needle to a syringe opened to 20 cc.
2. Insert the syringe and needle into the lower Y site of distal tubing.
3. Connect the distal tubing to the DPM through a three-way stopcock.

   Note: DPM height must be 0 ± 6 inches (0 ± 15 cm) from midline of the cassette.

4. Turn the rotary control knob to SET RATE.
5. Set the primary rate to 400 mL/hr.
6. Turn the rotary control knob to SET VTBI.
7. Set the volume to 100 mL.
8. Open the three-way stopcock to air.

   Note: Secure the syringe plunger to keep it from coming out during test.

9. Turn the rotary control knob to RUN and allow the infusion system to stabilize for one minute. Verify all air is cleared from the tubing.

10. Turn the rotary control knob to HOLD/RESET.
11. Set the DPM to measure pressure.
12. Turn the rotary control knob to RUN to start pumping fluid. Verify the occlusion alarm occurs when the DPM indicates 10.0 ± 1.8 psi (69.0 ± 12.4 kPa).
13. Turn the rotary control knob to HOLD/RESET to clear the occlusion alarm. Remove the syringe and needle from the Y site. Disconnect the distal tubing from the three-way stopcock.
14. Repeat Steps 1 through 13 for line B and line C.

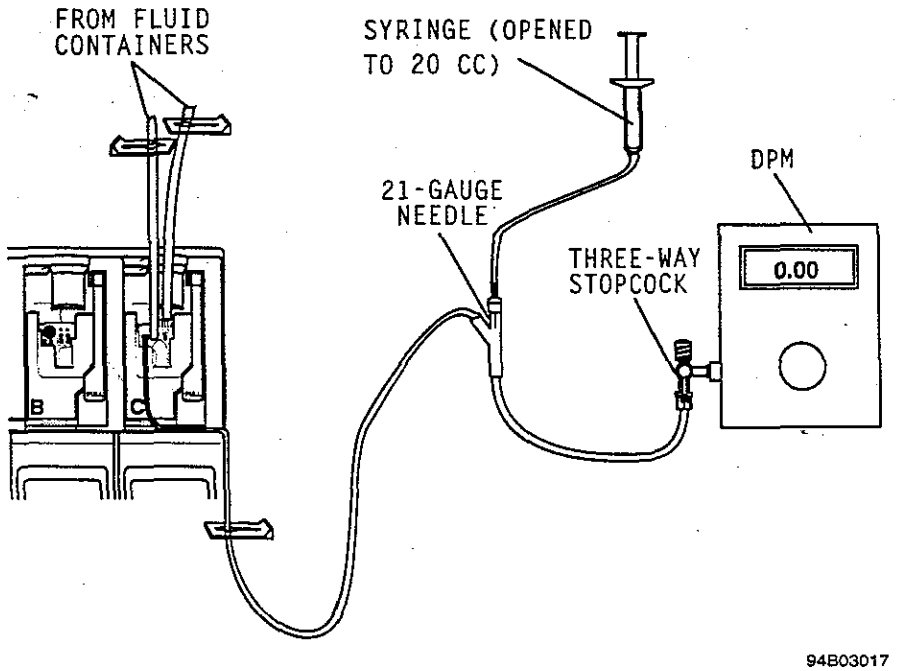

Figure 5-2. Distal Occlusion Test Setup

5.2.10

PROXIMAL OCCLUSION TEST

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

To perform the proximal occlusion test, proceed as follows:

1. Turn the rotary control knob on line A to RUN to start pumping fluid.
2. After several pumping cycles, clamp the tubing proximal to the cassette. After drops stop falling through the sight chamber, verify that an occlusion alarm occurs within three pumping cycles.
3. Press [SILENCE] and unclamp the proximal tubing.
4. Turn the rotary control knob to OFF CHARGE.
5. Repeat Steps 1 through 4 for line B and line C.

5.2.11
DELIVERY ACCURACY TEST

Note: Accuracy testing is for informational purposes only, and is not to be used as a re-release test. If there is any concern as to the XL3 infusion system accuracy, return the XL3 infusion system to Abbott Laboratories Technical Support Operations.

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

CAUTION: Do not remove protective cover from butterfly needle.

To perform the delivery accuracy test, proceed as follows:

1. Attach a 21-gauge needle to the distal end of the line A tubing. Verify the fluid container is 18 to 24 inches (46 to 60 cm) above the cassette pumping chamber. Verify all lines are unclamped.
2. Prime the needle and tubing. Verify no air is in the tubing. Place the needle in a 25-mL graduated cylinder.
3. Turn the rotary control knob to SET RATE and set the primary rate to 400 mL/hr.
4. Press [PRI/SEC] to display SECONDARY and set the secondary rate to 400 mL/hr.
5. Turn the rotary control knob to SET VTBI and press [PRI/SEC] to display PRIMARY.
6. Set the primary volume to 10 mL.
7. Press [PRI/SEC] to display SECONDARY and set the secondary rate to 10 mL.
8. Turn the rotary control knob to CLEAR VOL to clear previous value. Verify four beeps sound.
9. Assure the graduated cylinder is dry.
10. Turn the rotary control knob to RUN to start pumping fluid. Verify the volume delivered is 20 ± 1.0 mL. Verify that after VTBI is complete, the selected line changes to KVO mode at a rate of 1 mL/hr.
11. Turn the rotary control knob to OFF CHARGE.
12. Clamp both lines. Remove the needle from the distal tubing. Remove the cassette from the infusion system.
13. Repeat Steps 1 through 12 for line B and line C.

5.2.12
EMPTY CONTAINER/AIR-IN-LINE ALARM TEST

Note: When performing the PVT, line A, line B, and line C must be tested; however, if appropriate, the test may be performed on all lines concurrently.

To perform the empty container/air-in-line alarm test, refer to *Figure 5-3, Special Cassettes with Bubble Sensor Tips Removed*, then proceed as follows:

1. Install the special cassette marked EMPTY on line A. Confirm the special cassette proximal bubble sensor tips are removed.
2. Turn the rotary control knob to SET VTBI.
3. Set the volume to 100 mL.

4. Turn the rotary control knob to RUN to start pumping. Verify that within three pumping cycles, the audible alarm sounds and AIR IN LINE and BACKPRIMING is displayed on the LCD screen.
5. Turn the rotary control knob to HOLD/RESET.
6. Open the cassette door and remove the cassette.
7. Install the special AIR cassette.
8. Turn the rotary control knob to RUN to start pumping. Verify that within three pumping cycles, the alarm sounds and AIR IN LINE is displayed on the LCD screen.
9. Turn the rotary control knob to HOLD/RESET.
10. Open the cassette door and remove the cassette.
11. Repeat Steps 1 through 10 for line B and line C.

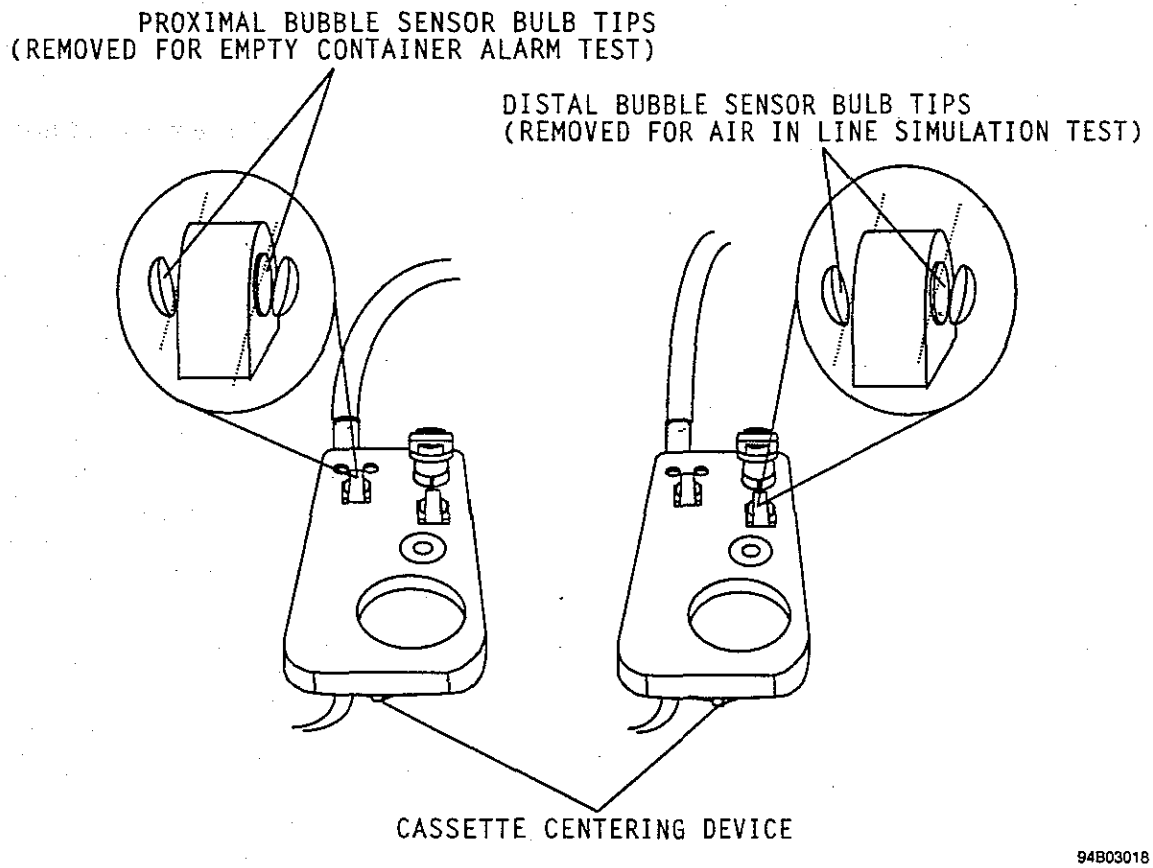

Figure 5-3. Special Cassettes with Bubble Sensor Tips Removed

5.2.13

BATTERY CHARGER CURRENT TEST

Note: Make certain battery is in good condition and charged.

Note: When performing this test, line A, line B, and line C must be tested independently.

To perform the battery charger current test, refer to *Figure 5-4, Battery Charger Current Test Configuration*, then proceed as follows:

1. Disconnect the XL3 infusion system from AC (mains) power. Remove the battery access cover and disconnect battery from the line to be tested.
2. Connect the battery charger test box and DMM between the battery and line A. Set the DMM to measure current. Make certain switch S1 of the battery charger test box is open.
3. Connect the XL3 infusion system to AC (mains) power. Measure current on the DMM within 20 seconds of applying AC (mains) power.
4. If the battery has connector pins 3 and 4 shorted, the current measurement should be 0.78 ± 0.14 A. If the battery does not have connector pins 3 and 4 shorted, the current measurement should be 1.2 ± 0.2 A.
5. Disconnect the battery test box and DMM from the battery and selected line. Reconnect the battery. Replace the battery cover and secure.
6. Repeat Steps 1 through 5 for line B and line C.

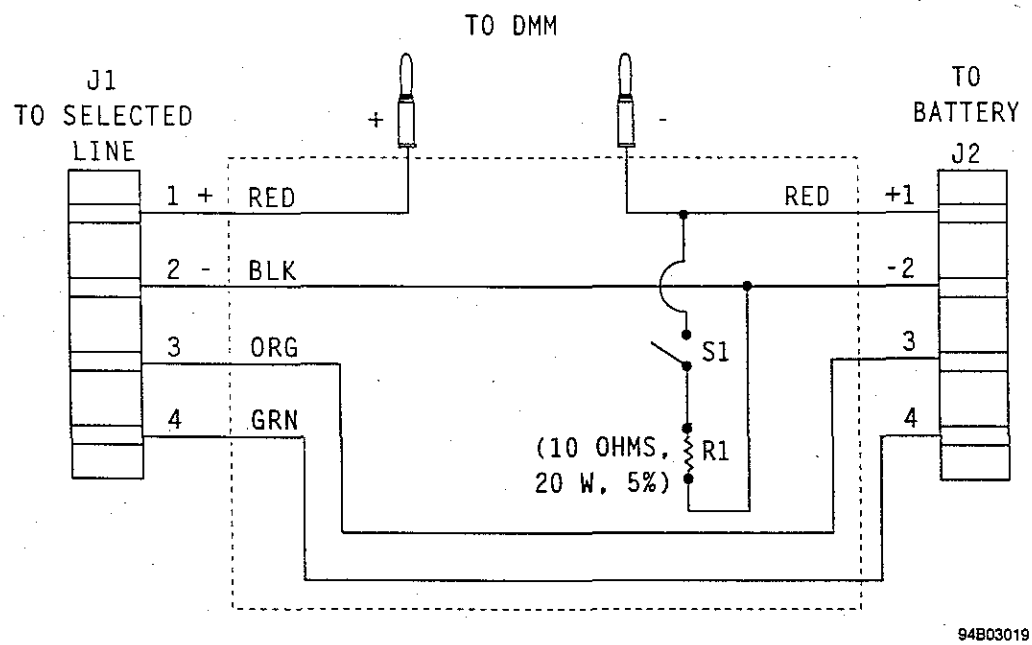

Figure 5-4. Battery Charger Current Test Configuration

5.2.14
ELECTRICAL SAFETY TEST

To perform the electrical safety test, proceed as follows:

1. Disconnect the XL3 infusion system from AC (mains) power.
2. Connect the infusion system AC (mains) power cord to the safety analyzer.
3. Connect the safety analyzer ground lead to the XL3 infusion system ground test-point screw.
4. Check the leakage current with the safety analyzer. Leakage current must not exceed 50 microamperes (μA) (AC RMS).
5. Measure the resistance of the AC (mains) connector ground lug with the safety analyzer. Resistance should not exceed 0.1 ohm.

5.2.15
END OF PERFORMANCE VERIFICATION TEST

If all tests have been successful for line A, line B, and line C, proceed as follows:

1. Clear dose history.
2. Reset the XL3 infusion system to the original configuration.
3. Return the XL3 infusion system to service.

Note: If any tests fail, refer to *Section 6, Troubleshooting*, or contact Abbott Laboratories Technical Support Operations.

Section 6

TROUBLESHOOTING

This section contains information on obtaining technical assistance, and alarm messages and error codes for the XL3 infusion system.

6.1
TECHNICAL ASSISTANCE

For technical assistance, product return authorization, and to order parts, accessories, or manuals within the United States, contact Abbott Laboratories Technical Support Operations.

1-800-241-4002

Send all authorized, prepaid returns to the following address:

Abbott Laboratories
Technical Support Operations
960 Linda Vista Avenue
Mountain View, California 94043

From outside the United States, contact the nearest Abbott Laboratories representative.

6.2
ALARM MESSAGES AND ERROR CODES

Under most alarm conditions, each XL3 infusion system line ceases operation, generates an audible alarm, and displays an alarm message or error code on the LCD screen. There are two categories of alarm error codes: error codes that can be cleared by the operator and error codes that require qualified service personnel.

6.2.1
OPERATIONAL ALARM MESSAGES

Table 6-1, Operational Alarm Messages and Corrective Actions, lists alarm messages that can be cleared by the operator. Also listed in *Table 6-1* are the alarm messages, descriptions, possible causes, and corrective actions.

Note: Operational alarm messages are displayed on the LCD screen. Associated error codes are displayed in the alarm history.

Table 6-1. Operational Alarm Messages and Corrective Actions

Error Code	Alarm Message	Description	Possible Cause	Corrective Action
01-1	OCCLUSION	Distal occlusion alarm	Distal pressure above 10 psi for five seconds	Unkink tubing or Check IV site or Replace administration set If condition recurs, contact Abbott Laboratories
01-2		Distal occlusion alarm	Distal pressure above 10 psi for two plunger strokes	
01-3		Distal occlusion alarm	Distal pressure above 13 psi	
01-4		Distal occlusion alarm	Excessive distal pressure during valve leak test	
03-1		Proximal occlusion alarm	Clamp closed, tubing kinked, possible occluded tubing, or defective administration set Defective pressure circuit	
03-2		Proximal occlusion on secondary during backpriming		
06-1	AIR IN LINE BACKPRIMING	Air detected in cassette	1000 microliters (µL) of air has entered the cassette since the last initialization	Backprime to expel air
07-1	AIR IN LINE	Distal air in line	100 µL bolus of air detected at distal sensor	Remove and reprime cassette
07-2		Distal air in line	260 µL of air detected in the last 2.6 mL of fluid delivered	Remove and reprime cassette
08-1	AIR IN LINE BACKPRIMING	Air detected in cassette	500 µL of air has entered the cassette in the last two intake strokes	Backprime to expel air

Table 6-1. Operational Alarm Messages and Corrective Actions

Error Code	Alarm Message	Description	Possible Cause	Corrective Action
10-1	CHECK SETTINGS	Check alarm settings	Rate and VTBI settings not correct	Turn rotary control knob to SET RATE or SET VTBI to check settings or enter values
11-1	TURN TO RUN	Turn to run alarm	Rotary control knob not in OFF CHARGE or RUN positions, or no key is pressed for five minutes	Turn rotary control knob to RUN, OFF CHARGE, or HOLD/RESET position
12-1	VTBI COMPLETE	Primary VTBI complete alarm	The VTBI for the primary channel has been delivered	Discontinue infusion or change container and program new VTBI setting
12-2		Secondary VTBI complete alarm	The VTBI for the secondary channel has been delivered	
13-1	DOOR/CASSETTE	Input/output valve leak test failure	Defective administration set	Turn rotary control knob to OFF CHARGE position, open and close cassette door, then restart. If condition recurs, replace administration set
13-2		Primary/secondary valve leak test failure		
			Fluid spillage around valve pins	Clean valve pins
13-3		Valve leak test failure due to excessive signal noise	Distal tubing continuously moving	Immobilize distal tubing

Table 6-1. Operational Alarm Messages and Corrective Actions

Error Code	Alarm Message	Description	Possible Cause	Corrective Action
16-1	TURN TO RUN	Rotary control knob in between valid states for five seconds	Rotary control knob not in OFF CHARGE or RUN position	Turn rotary control knob to RUN, OFF CHARGE, or HOLD/RESET position
			Defective switch	Replace switch
17-1	LOW BATTERY	Low battery alarm	Low battery	Connect XL3 infusion system to AC (mains) power or turn rotary control knob to HOLD/RESET, then to RUN position
17-2		Low battery re-alarms after 15 minutes	Low battery	Connect XL3 infusion system to AC (mains) power or turn rotary control knob to HOLD/RESET, then to RUN position
18-1		Discharged battery alarm	Fully discharged battery	Connect XL3 infusion system to AC (mains) power; turn rotary control knob to OFF CHARGE position
18-2	(Display blank)	XL3 infusion system shutdown one minute after discharged battery alarm	Fully discharged battery	Connect XL3 infusion system to AC (mains) power; turn rotary control knob to OFF CHARGE position

Table 6-1. Operational Alarm Messages and Corrective Actions				
Error Code	**Alarm Message**	**Description**	**Possible Cause**	**Corrective Action**
19-1	DOOR/CASSETTE	Door open	Cassette door open	Turn XL3 infusion system rotary control knob to OFF CHARGE position or close cassette door
			Cassette not seated properly	Reseat cassette

6.2.2
ERROR CODES REQUIRING TECHNICAL SERVICE

Table 6-2, Error Codes Requiring Technical Service, lists malfunction error codes that require technical service. Also listed in *Table 6-2* are the malfunction descriptions, possible causes, and corrective actions associated with each error code. Corrective actions listed in *Table 6-2* correlate to a failed line, specifically, line A, line B, and line C.

Note: The error code is displayed on the LCD screen; associated malfunction descriptions are not displayed. If reference to alarm history is required, refer to *Section 6.2.3, Service Mode.*

Note: Corrective actions listed in *Table 6-2* assume that all connectors are properly seated and cables are intact.

Note: If after performing a recommended corrective action listed in *Table 6-2*, the condition recurs, contact Abbott Laboratories Technical Support Operations.

Table 6-2. Error Codes Requiring Technical Service			
Error Code	**Malfunction Description**	**Possible Cause**	**Corrective Action**
20-1	Stack overflow	MCU RAM error	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
21-1	Critical data checksum failure at start up	MCU RAM error	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
		EEPROM failure	Replace mechanism assembly *(see Section 7.2.16)*

Table 6-2. Error Codes Requiring Technical Service

Error Code	Malfunction Description	Possible Cause	Corrective Action
21-2	Critical data checksum failure during operation	MCU RAM error	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
29-1	ROM checksum failure at startup	MCU ROM error	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
29-2	ROM checksum failure during operation	MCU ROM error	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
29-3	ROM checksum test not being performed	MCU execution error	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
34-1	EEPROM read/write test failure	Decode circuit failure	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
		EEPROM failure	Replace mechanism assembly *(see Section 7.2.16)*
41-1	LCD display driver chip test failure	Decode circuit failure	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
		Driver chip failure	Replace display PWA (*see Section 7.2.15.1*)
44-1 44-2 If fuse on effected channel is ok and mcu/mcu piggy back ok, check Pump Mech.	Audio BUZZER signal out of range	Audio buzzer or circuit failure	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
		A/D converter malfunction on MCU IC U6	Check motherboard PWA fuses F1, F3, and F5; if any fuse is defective, replace motherboard PWA *(see Section 7.2.13)*
		A/D converter reference voltage is incorrect	Replace mechanism assembly *(see Section 7.2.16)*

Table 6-2. Error Codes Requiring Technical Service

Error Code	Malfunction Description	Possible Cause	Corrective Action
45-1	[PRI/SEC] key stuck in the on position	Display PWA switch S1 shorted or stuck	Replace display PWA *(see Section 7.2.15.1)*
		Front panel key insert stuck	Replace key insert *(see Section 7.2.15.2)* or Replace front enclosure assembly *(see Section 7.2.10)*
45-2	[UP ARROW] key stuck in the on position	Switch S3 on display PWA is shorted or stuck	Replace display PWA *(see Section 7.2.15.1)*
		Front panel key insert stuck	Replace key insert *(see Section 7.2.15.2)* or Replace front enclosure assembly *(see Section 7.2.10)*
45-3	[DOWN ARROW] key stuck in the on position	Display PWA switch S2 shorted or stuck	Replace display PWA *(see Section 7.2.15.1)*
45-4	[TITRATE] key stuck in the on position	Display PWA switch S4 shorted or stuck	Replace display PWA (*see Section 7.2.15.1*)
		Front panel key insert stuck	Replace key insert *(see Section 7.2.15.2)* or Replace front enclosure assembly *(see Section 7.2.10)*

Table 6-2. Error Codes Requiring Technical Service

Error Code	Malfunction Description	Possible Cause	Corrective Action
45-5	[BACKPRIME] key stuck in the on position	Display PWA switch S5 shorted or stuck	Replace display PWA (*see Section 7.2.15.1*)
		Front panel key insert stuck	Replace key insert *(see Section 7.2.15.2)* or Replace front enclosure assembly *(see Section 7.2.10)*
45-6	[SILENCE] key stuck in on position	Display PWA switch S6 shorted or stuck	Replace display PWA (*see Section 7.2.15.1*)
		Front panel key insert stuck	Replace key insert *(see Section 7.2.15.2)* or Replace front enclosure assembly *(see Section 7.2.10)*
59-1	Valve motor moving at the wrong time	Position sensor failure	Replace mechanism assembly (*see Section 7.2.16*)
		Motor drive circuit failure	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
60-1	Plunger motor position flag is a continuous high during re-synchronization	Plunger motor not moving	Replace mechanism assembly (*see Section 7.2.16*)
		Position sensor failure	
60-2	Plunger motor position signal is a continuous low during re-synchronization	Enable circuit failure	Replace mechanism assembly (*see Section 7.2.16*)
		Position sensor failure	
		Plunger motor not moving	
61-1	I/O motor position flag is a continuous high during re-synchronization	I/O motor not moving	Replace mechanism assembly (*see Section 7.2.16*)
		Position sensor failure	

Table 6-2. Error Codes Requiring Technical Service

Error Code	Malfunction Description	Possible Cause	Corrective Action
61-2	I/O motor position signal is a continuous low during re-synchronization	Enable circuit failure	Replace mechanism assembly (*see Section 7.2.16*)
		Position sensor failure	
		Input/output motor not moving	
62-1	Primary/secondary motor position flag is a continuous high during re-synchronization	Primary/secondary motor not moving	Replace mechanism assembly (*see Section 7.2.16*)
		Position sensor failure	
62-2	Primary/secondary motor position signal is a continuous low during re-synchronization	Enable circuit failure	Replace mechanism assembly (*see Section 7.2.16*)
		Position sensor failure	
		Primary/secondary motor not moving	
63-1	Plunger motor phase loss	Plunger motor does not have enough torque	Replace mechanism assembly (*see Section 7.2.16*)
		Mechanical assembly failure	
64-1	I/O motor phase loss	I/O motor does not have enough torque	Replace mechanism assembly (*see Section 7.2.16*)
		Mechanical mechanism breakage	
65-1	Primary/secondary motor phase loss	Primary/secondary motor does not have enough torque	Replace mechanism assembly (*see Section 7.2.16*)
		Mechanical mechanism breakage	
71-1	Internal timers out of tolerance	MCU PWA timer error	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*

Table 6-2. Error Codes Requiring Technical Service

Error Code	Malfunction Description	Possible Cause	Corrective Action
73-1	+2.5 VDC A/D converter reference voltage out of tolerance	+2.5 VDC reference to A/D converter missing or bad	Check motherboard PWA fuses F1, F3, and F5; if any fuse is defective, replace motherboard PWA *(see Section 7.2.13)* or Replace mechanism assembly *(see Section 7.2.16)*
		+3.75 VDC reference to A/D converter missing or bad	
		A/D converter malfunction on MCU IC U6	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
73-2	+5 VDC A/D converter reference voltage out of tolerance	+2.5 VDC reference to A/D converter missing or bad	Check motherboard PWA fuses F1, F3, and F5; if any fuse is defective, replace motherboard PWA *(see Section 7.2.13)* or Replace mechanism assembly *(see Section 7.2.16)*
		+3.75 VDC reference to A/D converter missing or bad	
		A/D converter malfunction on MCU IC U6	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
74-1	Air sensor self test failure. Signal present when sensors are disabled	Air sensor or circuitry failure	Replace mechanism assembly (*see Section 7.2.16*)
74-4	Proximal air sensor signal is too high	Air sensor X1 or circuitry failure	Replace mechanism assembly (*see Section 7.2.16*)
74-5	Distal air sensor signal is too high	Air sensor X2 or circuitry failure	Replace mechanism assembly (*see Section 7.2.16*)
81-1	MCU PWA signals HKDC and DHKDC are not identical	MCU PWA failure	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*
		Power supply PWA failure	Replace power supply PWA *(see Section 7.2.11)*

Table 6-2. Error Codes Requiring Technical Service

Error Code	Malfunction Description	Possible Cause	Corrective Action
81-2	Power supply PWA signal HKDC is out of tolerance	Power supply PWA failure	Replace power supply PWA *(see Section 7.2.11)*
		MCU PWA failure	Replace MCU PWA *(see Section 7.2.12)*
81-3	VMOT signal is out of tolerance when AC (mains) is applied	Motherboard PWA failure	Replace motherboard PWA *(see Section 7.2.13)*
		Power supply PWA failure	Replace power supply PWA *(see Section 7.2.11)*
		MCU PWA failure	Replace MCU PWA *(see Section 7.2.12)*
81-4	VMOT drops too much when motor is energized	Motherboard PWA failure	Replace motherboard PWA *(see Section 7.2.13)*
		Motor drawing excessive current	Replace mechanism assembly (*see Section 7.2.16*)
		Bad battery	Replace battery assembly (*see Section 7.2.4*)
90-1	Calibration data in EEPROM checksum failure	EEPROM internal failure	Contact Abbott Laboratories
		EEPROM decode circuitry failure	
94-1	Rotary control knob signal present when rotary control knob is disabled	Rotary control knob circuitry failure	Replace display PWA *(see Section 7.2.15.1)*
94-2	Illegal rotary control knob signal present	Rotary control knob circuitry failure	Replace display PWA *(see Section 7.2.15.1)*
94-4	Reed switch does not match rotary control knob signal	Rotary control knob circuitry failure	Replace display PWA *(see Section 7.2.15.1)*
		Reed switch failure	
95-1	Primary valve pin not moving	Pin detect circuitry failure	Replace mechanism assembly (*see Section 7.2.16*)
		Valve pin not present	
		Valve pin not moving	

Table 6-2. Error Codes Requiring Technical Service

Error Code	Malfunction Description	Possible Cause	Corrective Action
95-2	Secondary valve pin not moving	Pin detect circuitry failure	Replace mechanism assembly (*see Section 7.2.16*)
		Valve pin not present	
		Valve pin not moving	
99-1 thru 99-6	Failure of one or more internal software self-tests	MCU PWA internal failure	Replace MCU/MCU piggyback assembly *(see Section 7.2.12)*

6.2.3

SERVICE MODE

The service mode provides diagnostic and repair service information. The service mode is entered by simultaneously pressing the [TITRATE] and [SILENCE] keys while turning the rotary control knob from the OFF/CHARGE position. The [TITRATE] and [SILENCE] keys must be held until the end of the self-test sequence, at which time normal pump operation is disabled and the service mode is accessed.

The following sections detail the service mode functions: alarm history, software revision number, run-time, and battery run-time. *Table 6-3, Service Mode Rotary Control Knob Settings*, lists the rotary control knob settings used during service mode and provides service mode information for each setting.

Table 6-3. Service Mode Rotary Control Knob Settings

Rotary Control Knob Setting	Service Mode Information
SET RATE	Alarm history
SET VTBI	Software revision number
RUN	Run time and battery run time

6.2.3.1

ALARM HISTORY

When an XL3 infusion system line is in service mode and the rotary control knob is turned to SET RATE, the alarm history can be viewed. In viewing the alarm history list, large digits indicate an alarm error number (Er01, Er02, Er03, etc.) and small digits indicate the four-digit alarm code. If there are no entries in the alarm history, the large digits indicate Er, and the small digits indicate ----.

The infusion system up arrow and down arrow keys are used to scroll through the alarm history. The first entry displayed is the most recent alarm. To view a previous alarm, press the up arrow key. The large numerals increment to indicate the order of alarms.

Pressing the up arrow key has no effect when the end of the alarm history is reached. To review the entries, press the down arrow key.

When preventive maintenance is performed on the XL3 infusion system, it may be desirable to clear the alarm history list. Clear the alarm history by simultaneously pressing and holding the [PRI/SEC] key and the [BACKPRIME] key for four seconds. The small digits flash and a tone sounds four times at a once-per-second rate. After four seconds, the alarm history list is cleared. If the [PRI/SEC] key and the [BACKPRIME] key are not simultaneously pressed and held for the full four seconds, the alarm history list will not be cleared.

6.2.3.2
SOFTWARE REVISION NUMBER

When the XL3 infusion system is in the service mode and the rotary control knob is turned to SET VTBI, the software revision number can be viewed.

The software revision decimal point does not display, but is implied after the first digit. For example, if the display shows 105, then the software revision number is 1.05. This information may be necessary when contacting Abbott Laboratories.

6.2.3.3
RUN TIME AND BATTERY RUN TIME

When the XL3 infusion system is in the service mode and the rotary control knob is turned to RUN, the run time and battery run time can be viewed.

In the run-time and battery run-time display, large digits indicate the total pump run time in tens of hours and the small digits indicate the battery run time in tens of hours. For example: if the large digits indicate 245 and the small digits indicate 79, the particular line has been operated for a total of 2,450 hours and has also been operated on battery for 790 of those 2,450 hours.

In replacing an XL3 infusion system battery, it may be desirable to clear the battery run time. Simultaneously press and hold the [PRI/SEC] key and the [BACKPRIME] key for four seconds; the small digits flash and a tone sounds four times at a once-per-second rate. After four seconds, the battery run time is cleared. If the [PRI/SEC] key and the [BACKPRIME] key are not simultaneously pressed and held for the full four seconds, the battery run time will not be cleared. The total XL3 infusion system line time cannot be cleared.

6.3
TROUBLESHOOTING PROCEDURES

Table 6-4, Troubleshooting with the PVT, lists failures that may be detected during the PVT. If an error code is displayed, see *Section 6.2, Alarm Messages and Error Codes.*

Table 6-4. Troubleshooting with the PVT

Test Failures	Possible Causes	Corrective Actions
Self test *Section 5.2.4*	Cassette not properly installed	Reprime and re-insert cassette
	Defective MCU/MCU piggyback assembly	Replace MCU/MCU piggyback assembly
	Defective motherboard PWA	Replace motherboard PWA
	Defective fuse	Replace fuse
	Defective AC (mains) power cord	Replace AC (mains) power cord
	Defective display PWA or display/MCU cable assembly	Replace display PWA or display/MCU cable assembly
	Defective power supply PWA	Replace power supply PWA
Keypad and rotary control knob test *Section 5.2.5*	Defective display PWA or ribbon cable	Replace display PWA or ribbon cable
	Defective rotary control knob	Replace rotary control knob
Open door alarm test *Section 5.2.6*	Cassette door open	Close cassette door
	Cassette not properly seated	Reseat cassette
	Defective sensor PWA	Replace mechanism assembly
	Defective mechanism assembly	Replace mechanism assembly
	Defective MCU/MCU piggyback assembly or sensor cable assembly	Replace MCU/MCU piggyback assembly or sensor cable assembly
	Defective display PWA or display/MCU cable assembly	Replace display PWA or display/MCU cable assembly
	Defective motherboard PWA	Replace motherboard PWA
Alarm level test *Section 5.2.7*	Defective MCU/MCU piggyback assembly	Replace MCU/MCU piggyback assembly
	Defective power supply PWA	Replace power supply PWA
Free flow test *Section 5.2.8*	Cassette not properly seated	Reseat cassette
	Defective cassette	Replace cassette
	Defective or dirty valve pins	Clean valve pins

Table 6-4. Troubleshooting with the PVT

Test Failures	Possible Causes	Corrective Actions
Distal occlusion test *Section 5.2.9*	Cassette not properly primed	Reprime cassette
	Defective cassette	Replace cassette
	Dirty sensor pin	Clean sensor pin
	Defective sensor PWA	Replace mechanism assembly
Proximal occlusion test *Section 5.2.10*	Closed proximal clamp	Open clamp
	Cassette not properly primed	Reprime cassette
	Defective cassette	Replace cassette
	Dirty sensor pin	Clean sensor pin
	Defective sensor PWA	Replace mechanism assembly
Delivery accuracy test *Section 5.2.11*	Administration set not properly primed	Reprime administration set
	Damaged or faulty administration set	Prime using new administration set
	Defective mechanism assembly	Replace mechanism assembly
Empty container/air-in-line alarm test *Section 5.2.12*	Defective special cassette	Replace special cassette
	Dirty bubble sensors	Clean bubble sensors
	Defective bubble sensor PWA	Replace mechanism assembly
	Defective sensor PWA	Replace mechanism assembly
Battery charger current test *Section 5.2.13*	Blown fuse	Replace fuse
	Defective AC (mains) power cord	Replace AC (mains) power cord
	Defective power supply PWA	Replace power supply PWA
	Defective motherboard PWA	Replace motherboard PWA

Table 6-4. Troubleshooting with the PVT		
Test Failures	**Possible Causes**	**Corrective Actions**
Electrical safety test *Section 5.2.14*	Insufficient ground connection	Attach lead to equipotential post on rear of XL3 infusion system
	Defective AC (mains) power cord	Replace AC (mains) power cord
	Defective power supply PWA	Replace power supply PWA

Section 7

REPLACEABLE PARTS AND REPAIR

This section itemizes all parts and subassemblies of the XL3 infusion system that are repairable within the scope of this manual. In addition, this section details replacement procedures for all listed parts.

WARNING:

POSSIBLE EXPLOSION HAZARD IF PRODUCT IS SERVICED IN THE PRESENCE OF FLAMMABLE ANESTHETICS.

7.1 REPLACEABLE PARTS

Replaceable parts for the XL3 infusion system are itemized in the spare parts price list and are identified in *Figure 9-1, IPB for the XL3 Infusion System*. *Table 9-2, IPB for the XL3 Infusion System* identifies each XL3 infusion system part by an index number that correlates to *Figure 9-1*. To request a copy of the current spare parts price list, contact Abbott Laboratories *(see Section 6.1, Technical Assistance)*. For convenient reference, insert a copy of the spare parts price list here.

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7.2
REPLACEMENT PROCEDURES

This section contains step-by-step replacement procedures for the XL3 infusion system. Prior to these procedures, safety and equipment precautions and required tools and materials are detailed. Unless otherwise stated, always perform the PVT after repair procedures.

7.2.1
SAFETY AND EQUIPMENT PRECAUTIONS

Before opening the front enclosure of the XL3 infusion system, take all necessary precautions for working on high-voltage equipment.

WARNING

UNLESS OTHERWISE INDICATED, DISCONNECT THE XL3 INFUSION SYSTEM FROM AC (MAINS) POWER BEFORE PERFORMING ANY REPLACEMENT PROCEDURE.

WARNING

POSSIBLE EXPLOSION HAZARD IF PRODUCT IS SERVICED IN THE PRESENCE OF FLAMMABLE ANESTHETICS.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

7.2.2
REQUIRED TOOLS AND MATERIALS

The following tools and materials, or equivalents, are required for the replacement procedures in this section. In addition, the beginning of each procedure lists tools and materials required for that specific procedure.

- ❑ Set of nutdrivers
- ❑ Small size flat blade screwdriver
- ❑ Medium size flat blade screwdriver
- ❑ No. 2 Phillips screwdriver
- ❑ Fuse puller
- ❑ Set of Allen wrenches
- ❑ Wide head pliers
- ❑ Long needle nose pliers
- ❑ X-acto® knife (with square, round, and pointed blades)
- ❑ Wood chisel, 3/8 inch
- ❑ Loctite® Black Max adhesive
- ❑ Isopropyl alcohol

7.2.3

RUBBER FOOT PAD REPLACEMENT

Recommended tools for this procedure are as follows: 3/8 inch wood chisel or an X-acto knife, isopropyl alcohol, and Loctite Black Max adhesive.

To replace the rubber foot pad, refer to *Figure 7-1, Bottom View of the XL3 Infusion System*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Place the XL3 infusion system face down to access the bottom.

   Note: Each rubber foot pad is bonded to an enclosure recess. Do not damage the enclosure recess.

4. Using a 3/8 inch wood chisel or an X-acto knife, remove the rubber foot pad(s) from the enclosure recess. Scrape the enclosure recess to remove adhesive residue.
5. Using isopropyl alcohol, clean the enclosure recess. Dry the enclosure recess thoroughly.
6. Using a small amount of adhesive, adhere the replacement foot pad to the enclosure recess. Clean area of excess adhesive.
7. After approximately five minutes, verify the foot pad is secure.
8. Connect the XL3 infusion system to AC (mains) power.

Replacement of a rubber foot pad is a routine maintenance procedure and no verification procedure is normally required. However, if the XL3 infusion system may have been damaged during a rubber foot pad replacement, perform the PVT in *Section 5.2*.

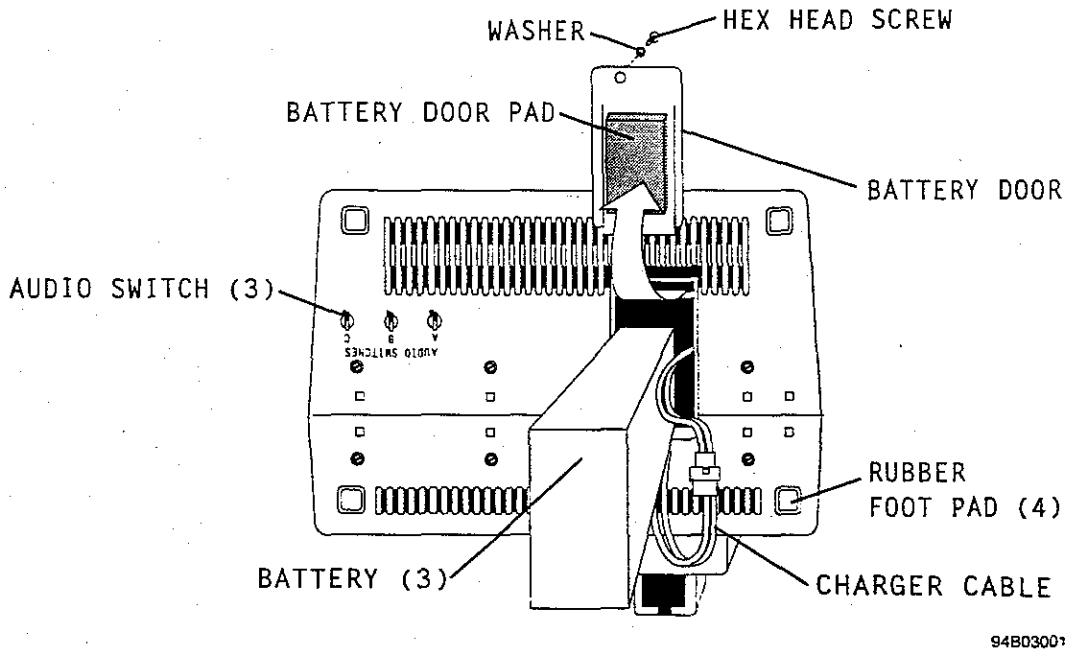

Figure 7-1. Bottom View of the XL3 Infusion System

7.2.4

BATTERY ASSEMBLY, BATTERY DOOR, AND BATTERY DOOR PAD REPLACEMENT

Recommended tools for this procedure are as follows: 1/4 inch nutdriver, X-acto knife, and isopropyl alcohol.

Note: There are three battery assemblies associated with the XL3 infusion system. Each battery assembly is identified by the corresponding battery assembly charger cable label: A, B, and C.

To replace the battery assembly, battery door, and battery door pad, refer to *Figure 7-1, Bottom View of the XL3 Infusion System*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Place the XL3 infusion system face down to access the control module assembly bottom.
4. Identify the battery assembly to be replaced (line A, line B, or line C). Using a 1/4 inch nutdriver, remove the hex head screw and washer securing the battery door. Remove the battery door.
5. Inspect the battery door and battery door pad for damage. If the battery door is damaged, replace it. If the battery door pad is damaged, remove it and the residual adhesive using an X-acto knife and isopropyl alcohol. Dry the battery door thoroughly. Remove the protective backing from the replacement door pad and adhere it to the battery door.

   Note: To replace a battery assembly, it may be necessary to remove all battery assemblies.

6. Remove the battery assembly charger cables and batteries from the battery enclosure. Disconnect the battery assembly from the designated charger cable (labeled A, B, and C).
7. Connect the replacement battery assembly to the charger cable. Insert the battery assemblies into the battery enclosure. Verify the charger cables are not pinched between the battery assemblies and battery enclosure.
8. Replace the battery door. Using a 1/4 inch nutdriver, replace the hex head screw and washer securing the battery door.
9. Connect the XL3 infusion system to AC (mains) power.

To verify successful battery assembly, battery door, and door pad replacement, perform the PVT in *Section 5.2*.

7.2.5

AC (MAINS) POWER CORD REPLACEMENT

The recommended tool for this procedure is a 1/4 inch nutdriver.

To replace the AC (mains) power cord, refer to *Figure 7-2, AC (Mains) Power Cord and Cord Clip Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Using a 1/4 inch nutdriver, remove the 12 hex head screws securing the control access cover to the control module assembly. Remove the control access cover, sliding it partially down the AC (mains) power cord.
4. Disconnect the AC (mains) power cord from the AC (mains) connector and remove it from the control access cover.
5. Insert the replacement AC (mains) power cord through the control access cover and connect it to the AC (mains) connector.
6. Replace the control access cover. Using a 1/4 inch nutdriver, replace the 12 hex head screws securing the control access cover to the control module assembly.
7. Connect the XL3 infusion system to AC (mains) power.

To verify successful AC (mains) power cord replacement, perform the PVT in *Section 5.2*.

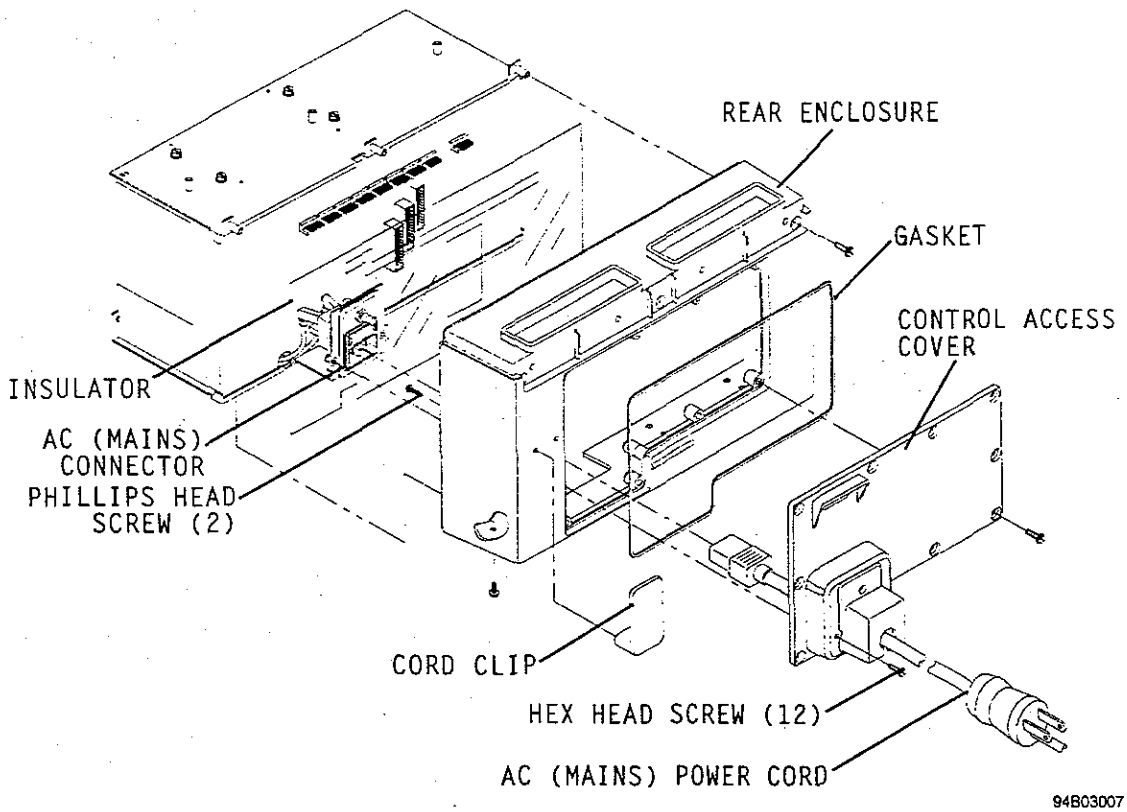

Figure 7-2. AC (Mains) Power Cord and Cord Clip Exploded View

7.2.6

FUSE AND FUSE DRAWER REPLACEMENT

Recommended tools for this procedure are as follows: 1/4 inch nutdriver and fuse puller.

To replace the fuses and fuse drawer, refer to *Figure 7-3, Control Chassis Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Using a 1/4 inch nutdriver, remove the 12 hex head screws securing the control access cover to the control module assembly. Remove the control access cover, sliding it partially down the AC (mains) power cord.

   CAUTION: Confirm the replacement fuse rating is identical to the fuse rating indicated on the XL3 infusion system label.

4. Inspect the fuses and fuse drawer. Using a fuse puller, replace the fuses if damaged or defective. Replace the fuse drawer if damaged or defective.
5. Replace the control access cover. Using a 1/4 inch nutdriver, replace the 12 hex head screws securing the control access cover to the control module assembly.
6. Connect the XL3 infusion system to AC (mains) power.

To verify successful fuse and fuse drawer replacement, perform the PVT in *Section 5.2*.

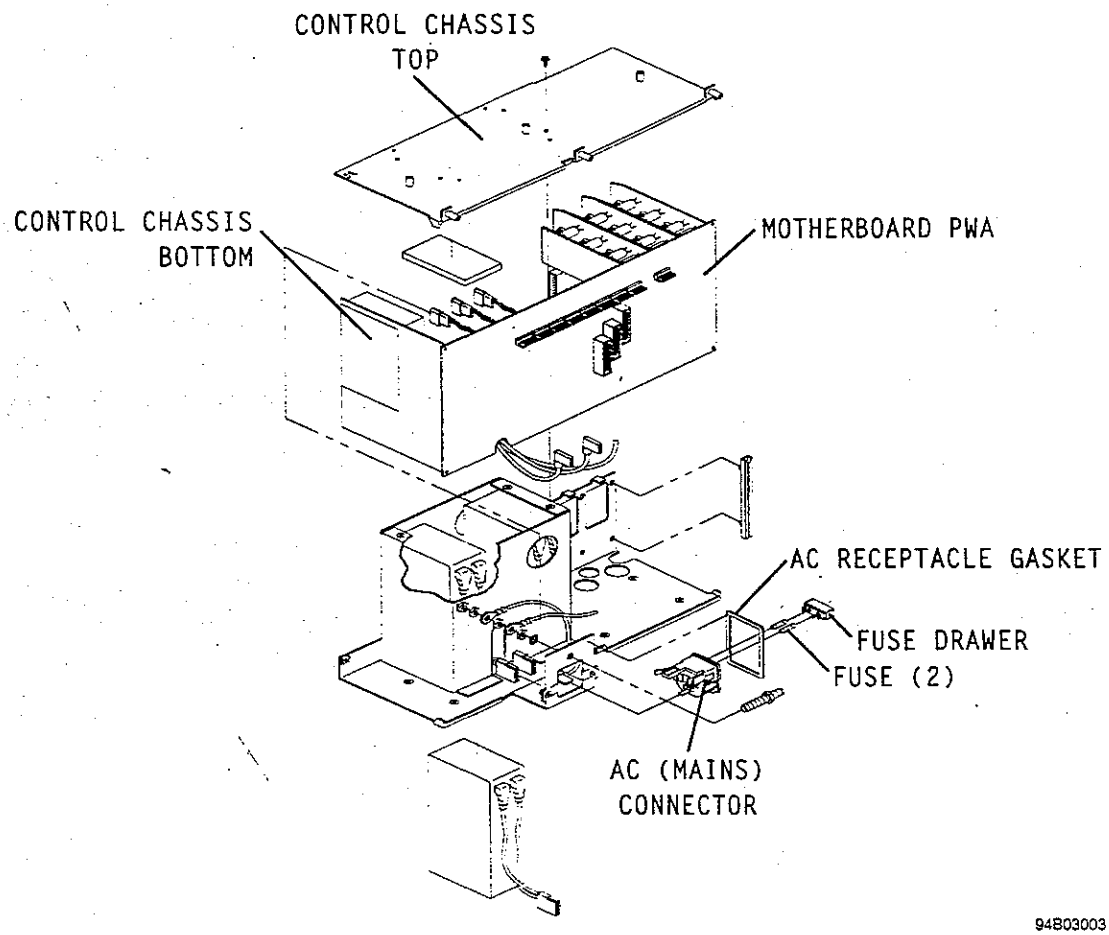

Figure 7-3. Control Chassis Assembly Exploded View

7.2.7

CONTROL/PUMP MODULE ASSEMBLY SEPARATION

The recommended tool for this procedure is a 1/4 inch nutdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To separate the control module and pump module assemblies, refer to *Figure 7-4, Control Module Assembly/Pump Module Assembly Separation*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Remove the battery door and battery assemblies as described in *Section 7.2.4, Battery Assembly, Battery Door, and Battery Door Pad Replacement.*
4. Using a 1/4 inch nutdriver, remove the 12 hex head screws securing the control access cover to the control module assembly. Remove the control access cover, sliding it partially down the AC (mains) power cord.

5. Disconnect the AC (mains) power cord from the AC (mains) connector. Disconnect the 12 connectors from the motherboard PWA as follows: sensor cable assemblies from jacks J5A through J5C, plunger motor cable assemblies from jacks J7A through J7C, I/O motor cable assemblies from jacks J8A through J8C, and primary/secondary motor cable assemblies from jacks J9A through J9C.
6. Using a 1/4 inch nutdriver, remove the four hex head screws securing the pump module assembly to the control module assembly.
7. Slide the pump module assembly rearward and then lift to disengage it from the control module assembly.
8. Tilt the pump module assembly forward and pull all cable assemblies free from the control module assembly. Separate the pump module assembly from the control module assembly.
9. Assemble the control module and pump module assemblies in the exact reverse order of separation.
10. Replace the battery assemblies and battery door in the exact reverse order of removal.
11. Connect the XL3 infusion system to AC (mains) power.

To verify successful assembly of the control module assembly to the pump module assembly, perform the PVT in *Section 5.2.*

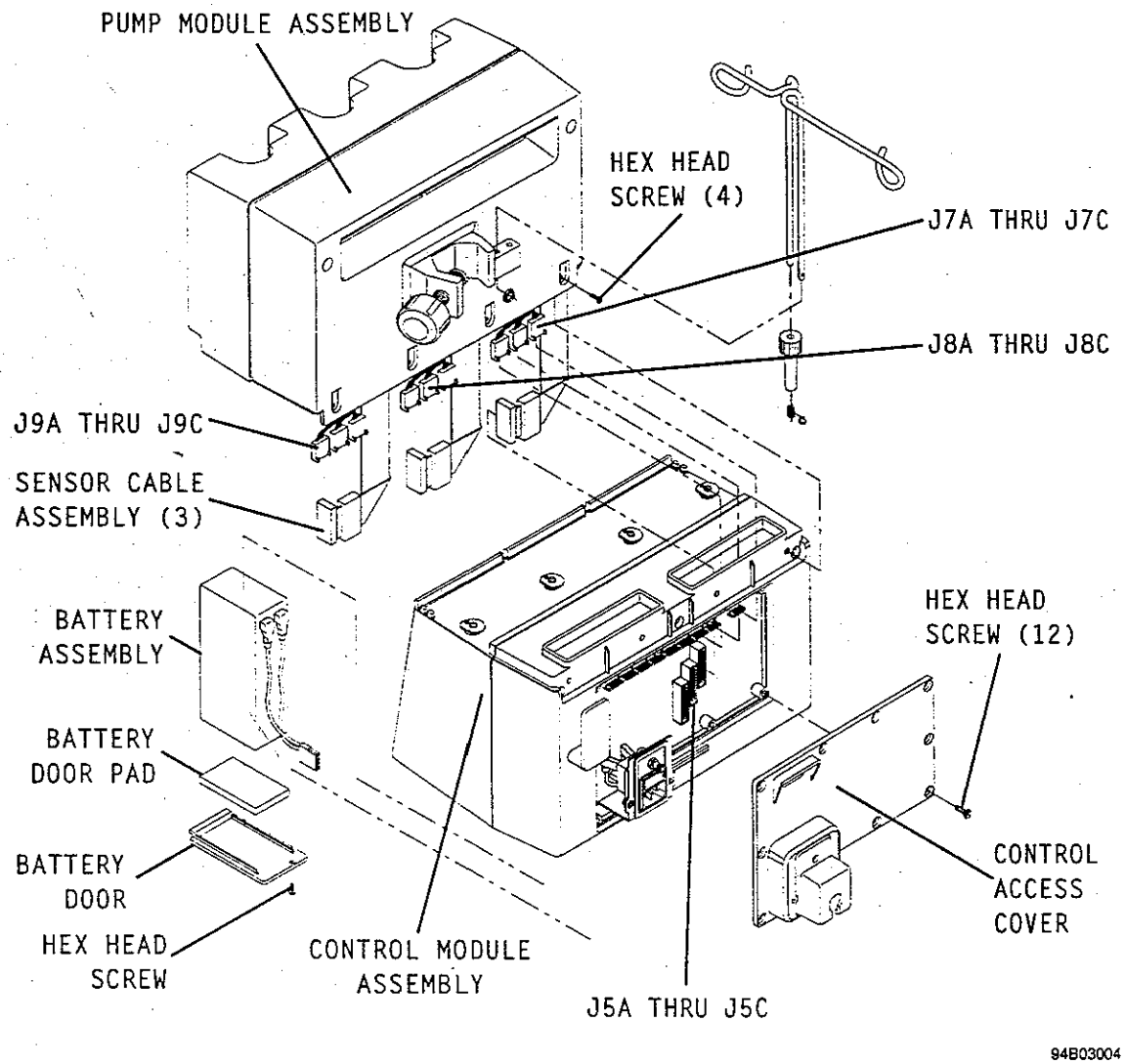

Figure 7-4. Control Module Assembly/Pump Module Assembly Separation

7.2.8

CONTROL MODULE ASSEMBLY FRONT AND REAR ENCLOSURE REPLACEMENT

Recommended tools for this procedure are as follows: 1/4 inch nutdriver and 5/64 inch Allen wrench.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the control module assembly front and rear enclosures, refer to *Figure 7-5, Control Module Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*

4. Using a 1/4 inch nutdriver, remove the three hex head screws from the top of the control module assembly and the three hex head screws from the rear of the control module assembly.
5. Position the control module assembly to access the bottom. Using a 1/4 inch nutdriver, remove the three hex head screws from the bottom of the front enclosure and the three hex head screws from the bottom of the rear enclosure. Separate the front and rear enclosures from the chassis assembly. Disconnect the display/MCU cable assembly from each MCU/MCU piggyback assembly at jack J3.
6. Refer to *Section 7.2.15, Control Module Assembly Front Enclosure Component Replacement.* Inspect the front enclosure assembly components for damage. Replace the front enclosure assembly components if necessary or set aside for re-assembly.
7. Using a 5/64 inch Allen wrench, remove the backing plate and front/rear gasket from the front enclosure. Inspect the backing plate and gasket for damage and replace if necessary, or set aside for re-assembly.
8. Re-assemble the replacement control module front and rear enclosure assemblies in the exact reverse order of disassembly.
9. Assemble the control module and pump module assemblies in the exact reverse order of separation.
10. Connect the XL3 infusion system to AC (mains) power.

To verify successful control module assembly front and rear enclosure replacement, perform the PVT in *Section 5.2.*

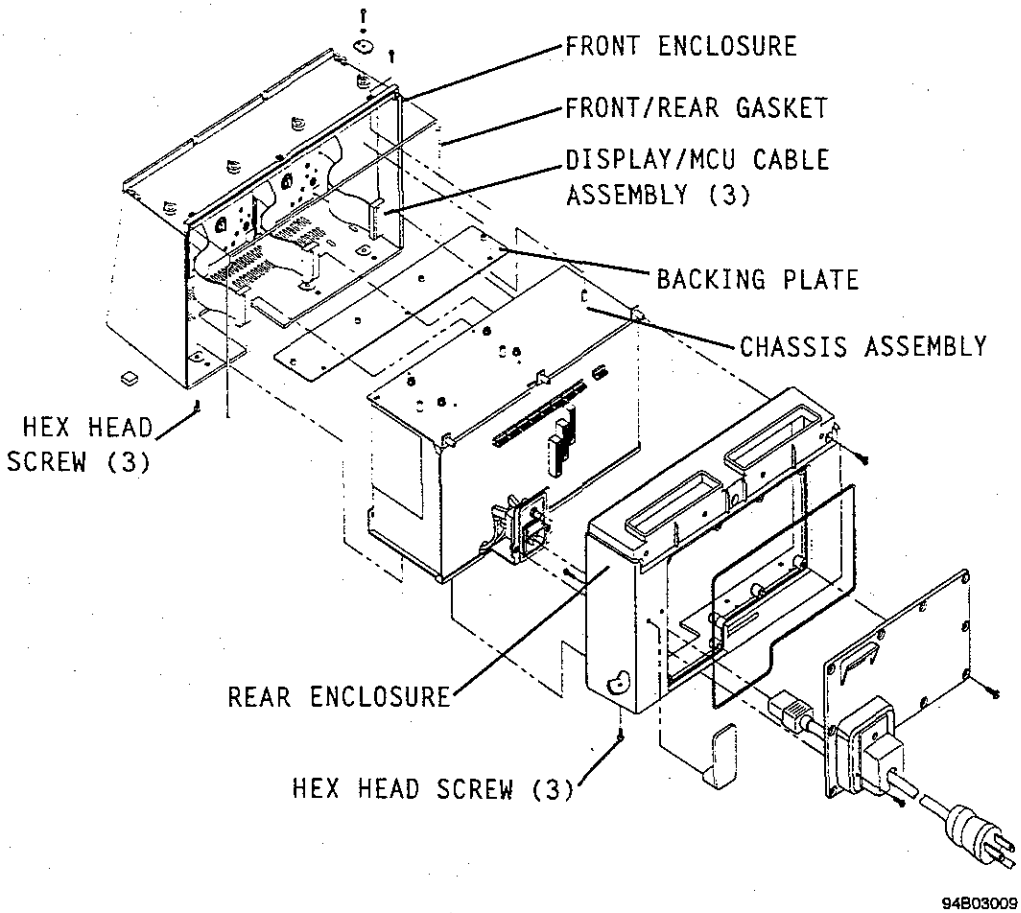

Figure 7-5. Control Module Assembly Exploded View

7.2.9

CORD CLIP REPLACEMENT

Recommended tools for this procedure are as follows: 1/4 inch nutdriver, 5/64 inch Allen wrench, No. 2 Phillips screwdriver, and small size flat blade screwdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the cord clip, refer to *Figure 7-2, AC (Mains) Power Cord and Cord Clip Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Disassemble the control module front and rear enclosure assemblies as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.*
5. Using a No. 2 Phillips screwdriver, remove the two Phillips head screws securing the cord clip to the rear enclosure. Remove the cord clip from the rear enclosure.
6. Replace the cord clip. Using a No. 2 Phillips screwdriver, replace the two Phillips head screws securing the cord clip to the rear enclosure.
7. Re-assemble the control module front and rear enclosure assemblies in the exact reverse order of disassembly.
8. Assemble the control module and pump module assemblies in the exact reverse order of separation.
9. Connect the XL3 infusion system to AC (mains) power.

To verify successful cord clip replacement, perform the PVT in *Section 5.2.*

7.2.10

PUMP MODULE ASSEMBLY FRONT AND REAR ENCLOSURE ASSEMBLY REPLACEMENT

Recommended tools for this procedure are as follows: 1/4 inch nutdriver and medium size flat blade screwdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the pump module assembly front and rear enclosure assemblies, refer to *Figure 7-6, Pump Module Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*

4. Using a No. 2 Phillips screwdriver, remove the four Phillips head screws from the rear of the pump module assembly.
5. Position the pump module assembly to access the bottom. Using a 1/4 inch nutdriver, remove the four hex-head screws from the pump module assembly bottom.
6. Separate the pump module assembly front and rear enclosures from the pump chassis. Assure the motor and sensor cable assemblies pass freely through the rear enclosure openings.
7. Inspect the front/rear gasket for damage. Replace the gasket if necessary or set aside for re-assembly.
8. Inspect the pole clamp backing plate and pole clamp assembly for damage. Replace the pole clamp backing plate and pole clamp assembly if necessary *(refer to Section 7.2.19, Pole Clamp Extrusion, Pole Clamp Backing Plate, and Adhesive-Backed Insulator Replacement)*, or set aside for re-assembly.
9. Re-assemble the replacement front and rear enclosures in the exact reverse order of separation.
10. Assemble the control module assembly to the pump module assembly in the exact reverse order of separation.
11. Connect the XL3 infusion system to AC (mains) power.

To verify successful pump module assembly front and rear enclosure replacement, perform the PVT in *Section 5.2*.

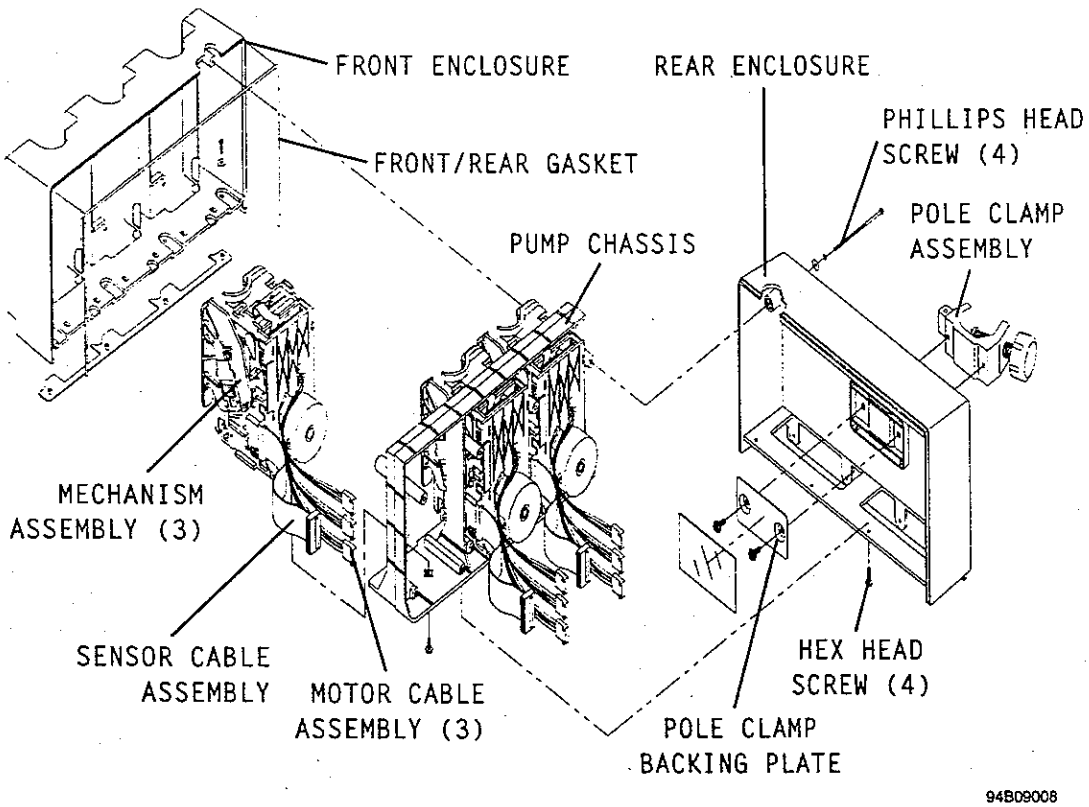

Figure 7-6. Pump Module Assembly Exploded View

7.2.11
POWER SUPPLY PWA REPLACEMENT

Recommended tools for this procedure are as follows: long needle nose pliers and 1/4 inch nutdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the power supply PWA, refer to *Figure 7-7, Power Supply PWA, MCU/MCU Piggyback Assembly, and Motherboard PWA Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the control module assembly front and rear enclosures as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.*
5. Using a 1/4 inch nutdriver, remove the four hex head screws securing the top of the control chassis assembly to the battery compartment.
6. At the power supply PWA, remove the connector from plug P4 and at the motherboard PWA, remove the connector from plug P25. Remove the power supply PWA from the motherboard PWA.
7. Tilt the motherboard PWA to access the power supply PWA. Using long needle nose pliers, remove connectors from plugs P16, P17, and P18.
8. Install the replacement power supply PWA in the exact reverse order of removal.
9. Assemble the control module assembly front and rear enclosure assemblies in the exact reverse order of separation.
10. Assemble the control and pump module assemblies in the exact reverse order of separation.
11. Connect the XL3 infusion system to AC (mains) power.

To verify successful replacement of the power supply PWA, perform the PVT in *Section 5.2.*

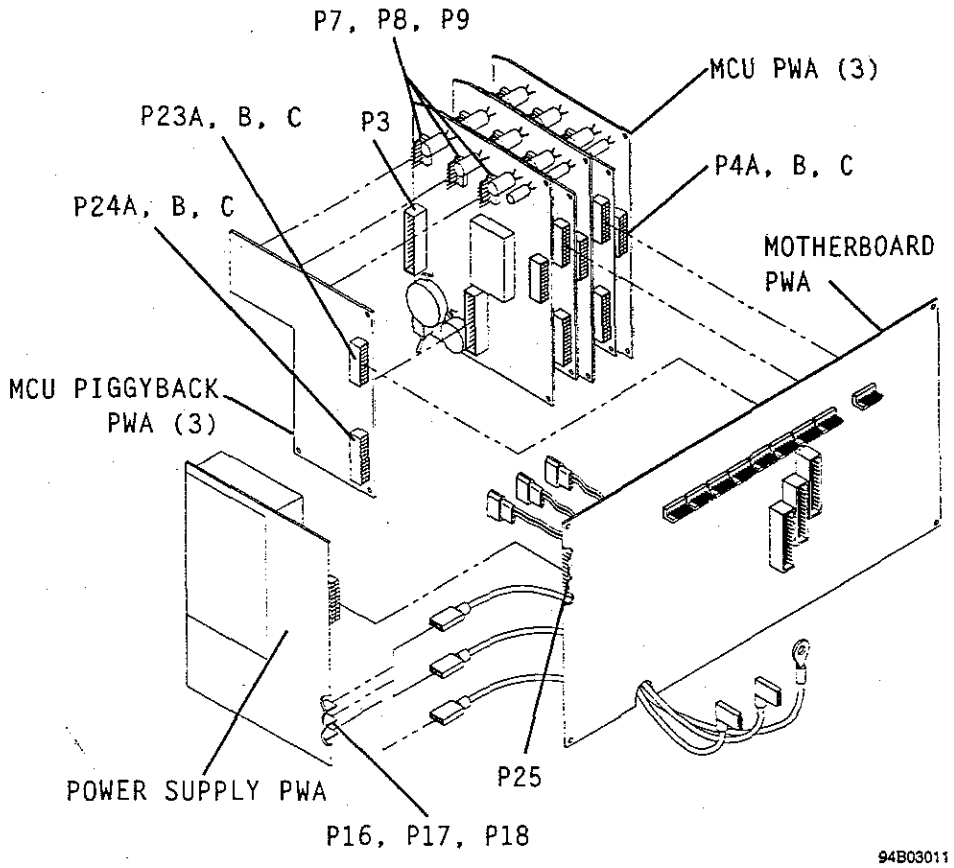

Figure 7-7. Power Supply PWA, MCU/MCU Piggyback Assembly, and Motherboard PWA Exploded View

7.2.12

MCU/MCU PIGGYBACK ASSEMBLY REPLACEMENT

The MCU/MCU piggyback assembly replacement procedure consists of removing the MCU/MCU piggyback assembly, separating the MCU PWA from the MCU piggyback PWA, assembling the MCU piggyback PWA to the MCU PWA, and replacing the MCU/MCU piggyback assembly. The recommended tool for this procedure is a 1/4 inch nutdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

Note: There are three MCU/MCU piggyback assemblies associated with the XL3 infusion system. Each MCU/MCU piggyback assembly is identified by the corresponding line: line A, line B, and line C, respectively.

To replace the MCU/MCU piggyback assembly and to replace the MCU PWA and the MCU piggyback PWA, refer to *Figure 7-7, Power Supply PWA, MCU/MCU Piggyback Assembly, and Motherboard PWA Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*

4. Separate the control module assembly front and rear enclosure assemblies as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.*
5. Using a 1/4 inch nutdriver, remove the four hex head screws securing the top of the control chassis assembly to the battery compartment.
6. Tilt the motherboard PWA to access the three MCU/piggyback assemblies.
7. Remove the line A MCU/piggyback assembly by removing the connectors at plugs P3, P4A, P23A, and P24A; remove the line B MCU/piggyback assembly by removing the connectors at plugs P3, P4B, P23B, and P24B; remove the line C MCU/piggyback assembly by removing the connectors at plugs P3, P4C, P23C, and P24C.
8. Separate the MCU PWA from the MCU piggyback PWA by removing the connectors at plugs P5, P7, P8, and P9.
9. Assemble the MCU piggyback PWA and the MCU PWA in the exact reverse order of separation.
10. Install the replacement MCU/MCU piggyback assembly in the exact reverse order of removal.
11. Assemble the control module assembly front and rear enclosure assemblies in the exact reverse order of separation.
12. Assemble the control module and pump module assemblies in the exact reverse order of separation.
13. Connect the XL3 infusion system to AC (mains) power.

To verify successful replacement of the MCU/piggyback assembly, perform the PVT in *Section 5.2.*

7.2.13

MOTHERBOARD PWA REPLACEMENT

Recommended tools for this procedure are as follows: long needle nose pliers and 1/4 inch nutdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the motherboard PWA, refer to *Figure 7-7, Power Supply PWA, MCU/MCU Piggyback Assembly, and Motherboard PWA Exploded View,* then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the control module assembly front and rear enclosure assemblies as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.* Remove the insulator from the rear of the motherboard PWA.
5. Using a 1/4 inch nutdriver, remove the four hex head screws securing the top of the control chassis assembly to the battery compartment.
6. Tilt the motherboard PWA to access the PWAs.
7. Remove the power supply PWA as described in *Section 7.2.11, Power Supply PWA Replacement.*

8. Remove each MCU/MCU piggyback assembly as described in *Section 7.2.12, MCU/MCU Piggyback Assembly Replacement.*
9. Lift and remove the motherboard PWA from the control chassis assembly. Assure that the three battery cables are clear of the battery compartment.
10. Install the replacement motherboard PWA in the exact reverse order of removal.
11. Replace each MCU/MCU piggyback assembly in the exact reverse order of removal.
12. Replace the power supply PWA in the exact reverse order of removal.
13. Replace the motherboard PWA insulator. Assemble the control module assembly front and rear enclosure assemblies in the exact reverse order of separation.
14. Assemble the control module and pump module assemblies in the exact reverse order of separation.
15. Connect the XL3 infusion system to AC (mains) power.

To verify successful replacement of the motherboard PWA, perform the PVT in *Section 5.2.*

7.2.14
AC (MAINS) CONNECTOR REPLACEMENT

The recommended tool for this procedure is long needle nose pliers.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the AC (mains) connector, refer to *Figure 7-3, Control Chassis Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Remove the AC (mains) power cord as described in *Section 7.2.5, AC (Mains) Power Cord Replacement.*
4. Remove the fuses and fuse drawer as described in *Section 7.2.6, Fuse and Fuse Drawer Replacement.*
5. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
6. Separate the control module assembly front and rear enclosure assemblies as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.*
7. Using long needle nose pliers, remove the three wire connectors from the AC (mains) connector.
8. Remove the AC (mains) connector from the control chassis assembly by pressing in the two tabs on each side of the connector.
9. Install the replacement AC (mains) connector in the exact reverse order of removal.
10. Assemble the control module assembly front and rear enclosure assemblies in the exact reverse order of separation.
11. Assemble the control module and pump module assemblies in the exact reverse order of separation.
12. Replace the fuses and fuse drawer in the exact reverse order of removal.

13. Replace the AC (mains) power cord in the exact reverse order of removal.
14. Connect the XL3 infusion system to AC (mains) power.

To verify successful replacement of the AC (mains) connector, perform the PVT in Section 5.2.

7.2.15
CONTROL MODULE ASSEMBLY FRONT ENCLOSURE COMPONENT REPLACEMENT

Control module assembly front enclosure component replacement includes the replacement of the following components:

- ❑ Display PWA and display/MCU cable assembly
- ❑ Key inserts
- ❑ Rotary control knobs, knob detent, washer, and snap retainer
- ❑ Front panel label

To replace the control module assembly front enclosure components, refer to *Figure 7-8, Control Module Front Enclosure Exploded View*, then perform the procedures in the following sections.

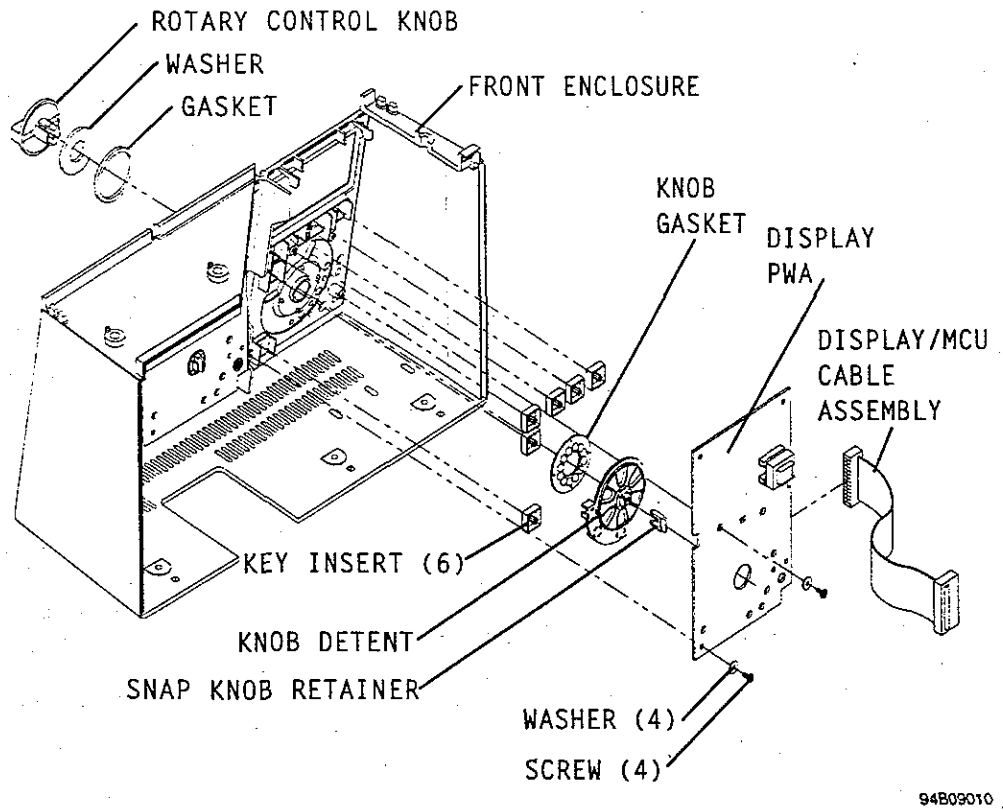

Figure 7-8. Control Module Front Enclosure Exploded View

7.2.15.1

DISPLAY PWA AND DISPLAY/MCU CABLE ASSEMBLY REPLACEMENT

The recommended tool for this procedure is a 1/8 inch nutdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

Note: There are three display PWAs and three display/MCU cable assemblies associated with the XL3 infusion system. Each display PWA and each display/MCU cable assembly is identified by the corresponding line: line A, line B, and line C, respectively.

To replace the display PWA and display/MCU cable assembly, refer to *Figure 7-8, Control Module Front Enclosure Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the control module assembly front and rear enclosure assemblies as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.*
5. Identify the display PWA to be replaced (line A, line B, or line C). Using a 1/8 inch nutdriver, remove the four screws securing the display PWA to the front enclosure assembly.
6. Inspect the display/MCU cable assembly for damage, replace if necessary.
7. Lift the display PWA from the front enclosure assembly.
8. Install the replacement display PWA in the exact reverse order of disassembly.
9. Assemble the control module assembly front and rear enclosure assemblies in the exact reverse order of separation.
10. Assemble the control module and pump module assemblies in the exact reverse order of separation.
11. Connect the XL3 infusion system to AC (mains) power.

To verify successful display PWA and display/MCU cable assembly replacement, perform the PVT in *Section 5.2.*

7.2.15.2

KEY INSERT REPLACEMENT

Recommended tools for this procedure are as follows: 1/8 inch nutdriver and long needle nose pliers.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

Note: Key inserts are identified by the corresponding display PWA. Each display PWA is identified by the corresponding line: line A, line B, and line C, respectively.

To replace the key inserts, refer to *Figure 7-8, Control Module Front Enclosure Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the control module assembly front and rear enclosure assemblies as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.*
5. Remove the display PWA covering the key insert(s) as described in *Section 7.2.15.1, Display PWA and Display/MCU Cable Assembly Replacement.*
6. Using long needle nose pliers, remove the key insert(s).
7. Install the replacement key insert(s).
8. Replace the display PWA in the exact reverse order of removal.
9. Assemble the control module assembly front and rear enclosure assemblies in the exact reverse order of separation.
10. Assemble the control module and pump module assemblies in the exact reverse order of separation.
11. Connect the XL3 infusion system to AC (mains) power.

To verify successful key insert replacement, perform the PVT in *Section 5.2.*

7.2.15.3

ROTARY CONTROL KNOB, KNOB DETENT, WASHER, GASKET, SNAP RETAINER, AND DETENT RING REPLACEMENT

Recommended tools for this procedure are as follows: 1/8 inch nutdriver and long needle nose pliers.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the rotary control knob, knob detent, washer, gasket, snap retainer, and detent ring, refer to *Figure 7-8, Control Module Front Enclosure Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the control module assembly front and rear enclosure assemblies as described in *Section 7.2.8, Control Module Assembly Front and Rear Enclosure Replacement.*
5. Remove the display PWA as described in *Section 7.2.15.1, Display PWA and Display/MCU Cable Assembly Replacement.*
6. Remove the key inserts as described in *Section 7.2.15.2, Key Insert Replacement.*

7. Using long needle nose pliers, remove the snap retainer.
8. Remove the rotary control knob, knob detent, washer, gasket, and detent ring. Inspect each part for damage; replace as necessary.
9. Install the rotary control knob, washer, and gasket as follows: position the gasket into the circular recess on the front side of the front enclosure assembly. Install the washer on the rotary control knob. Install the rotary control knob through the hole in the front enclosure assembly. Turn the rotary control knob to OFF CHARGE.

   Note: When the rotary control knob is in the OFF CHARGE position, the knob detent is positioned on the detent ring as shown in *Figure 7-8, Control Module Front Enclosure Exploded View.*

10. Place the front enclosure assembly face down. Position the detent ring on the four pins centered on the rotary control knob.
11. Using the snap retainer, secure the knob detent to the rotary control knob retainer clips and splines. Press the snap retainer firmly until secure.
12. Verify the rotary control knob rotates through the full range of positions.
13. Replace the key inserts in the exact reverse order of removal.
14. Replace the display PWA in the exact reverse order of removal.
15. Assemble the control module assembly front and rear enclosure assemblies in the exact reverse order of separation.
16. Assemble the control module and pump module assemblies in the exact reverse order of separation.
17. Connect the XL3 infusion system to AC (mains) power.

To verify successful rotary control knob, knob detent, washer, gasket, snap retainer, and detent ring replacement, perform the PVT in *Section 5.2.*

7.2.15.4

FRONT PANEL LABEL REPLACEMENT

Recommended tools for this procedure are as follows: X-acto knife and isopropyl alcohol.

To replace the front panel label, proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Identify the front panel label to be replaced (line A, line B, or line C). Using an X-acto knife, remove the front panel label from the front enclosure.
4. Using isopropyl alcohol, remove the adhesive residue from the front panel recess.
5. Remove the protective backing from the replacement front panel label. Press the replacement label into position on the front enclosure.

Replacement of the front panel label is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during the front panel label replacement, perform the PVT in *Section 5.2.*

7.2.16

PUMP CHASSIS ASSEMBLY, MECHANISM ASSEMBLY, AND SENSOR CABLE ASSEMBLY REPLACEMENT

The recommended tool for this procedure is a 1/4 inch nutdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the pump chassis assembly, mechanism assembly, and sensor cable assembly, refer to *Figure 7-9, Pump Chassis Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the pump module assembly front and rear enclosures as described in *Section 7.2.10, Pump Module Assembly Front and Rear Enclosure Assembly Replacement.*
5. Identify the mechanism assembly or sensor cable assembly to be replaced (line A, line B, or line C). Using a 1/4 inch nutdriver, remove the hex head screw from the bottom of the pump chassis assembly.
6. Slide the mechanism assembly forward from the pump chassis assembly. Disconnect the sensor cable assembly from the mechanism assembly.
7. Inspect the pump chassis assembly, mechanism assembly, and sensor cable assembly for damage; replace if necessary.
8. Remove protective backing from the replacement adhesive-backed insulator and adhere to the replacement mechanism assembly. Install the replacement pump chassis assembly, mechanism assembly, and sensor cable assembly in the exact reverse order of removal.
9. Assemble the pump module assembly front and rear enclosures in the exact reverse order of separation.
10. Assemble the control module and pump module assemblies in the exact reverse order of separation.
11. Connect the XL3 infusion system to AC (mains) power.

To verify successful pump chassis assembly, mechanism assembly, and sensor cable assembly replacement, perform the PVT in Section 5.2.

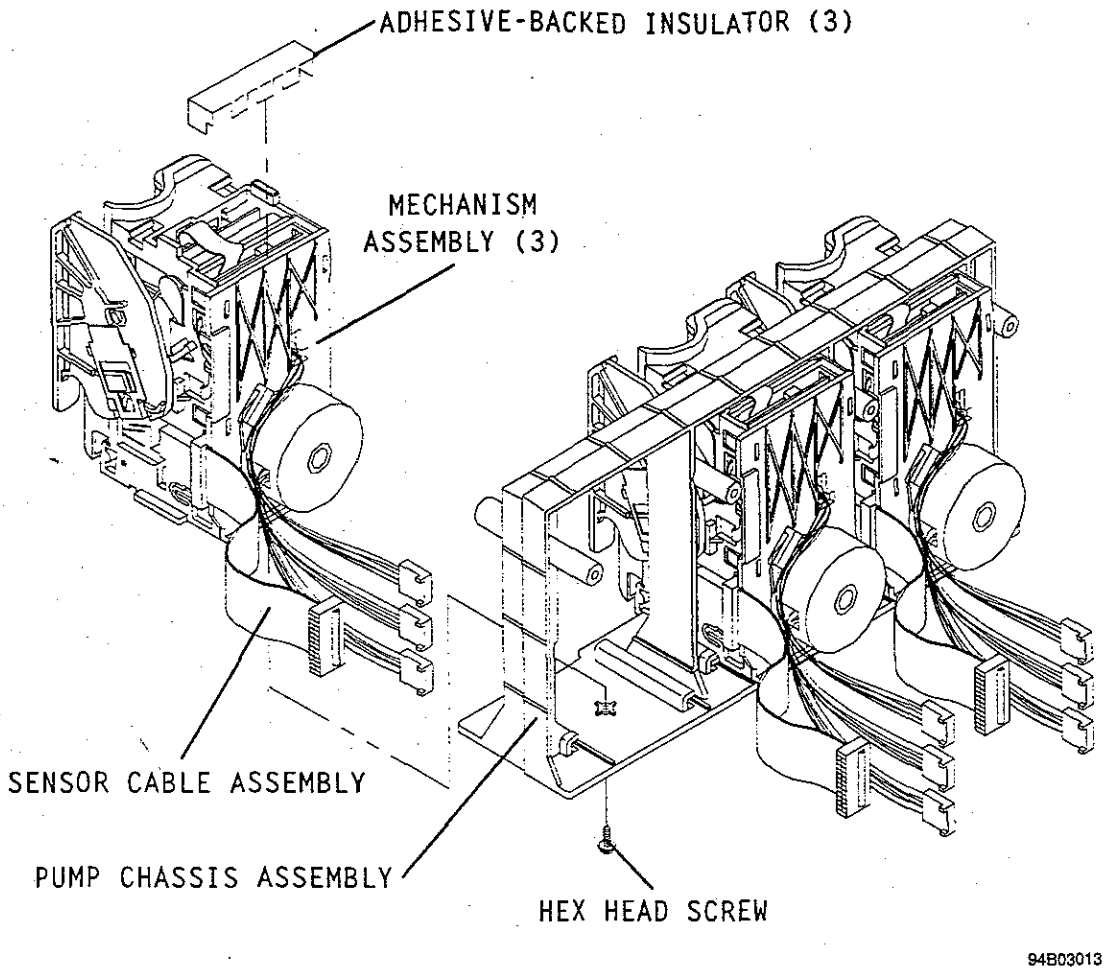

Figure 7-9. Pump Chassis Assembly Exploded View

7.2.17

DOOR ASSEMBLY AND MECHANISM SHIELD REPLACEMENT

This procedure requires long needle nose pliers.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the door assembly and mechanism shield, refer to *Figure 7-10, Door Assembly Exploded View* and *Figure 7-11, Mechanism Assembly Bottom View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the pump module assembly front and rear enclosures as described in *Section 7.2.10, Pump Module Assembly Front and Rear Enclosure Assembly Replacement.*

5. Identify the mechanism assembly to be removed (line A, line B, or line C). Remove the mechanism assembly as described in *Section 7.2.16, Pump Chassis Assembly, Mechanism Assembly, and Sensor Cable Assembly Replacement.*
6. Position the mechanism assembly to access the door assembly. Open the door assembly. Disengage the door assembly from the opener/handle assembly. Fully open the door assembly.
7. Disengage the clips that secure the back of the mechanism shield to the upper portion to the mechanism assembly. Pull the mechanism shield away from the top of the mechanism assembly at an approximate 15-degree angle. Pull the mechanism shield up and away, clearing mechanism assembly pins and plunger. Inspect the shield for damage, replace if necessary.
8. Close the door assembly and position the mechanism assembly to access the mechanism assembly bottom.
9. Grasp the door assembly pivot retainer clip. Squeeze the pivot retainer clip to free the flanges from the mechanism assembly. Once the flanges are free, grasp the pivot retainer clip with needle nose pliers and pull while rotating the pivot retainer clip toward the door assembly. Remove the pivot retainer clip.

   Note: When removing the door assembly, the left side door clip may fall free. Verify the position of the left side door clip prior to door assembly removal.

10. Fully open the door assembly. Note the position of the left side door clip. Rotate and lift the door assembly free of the left side door clip. Remove the door assembly from the hinge.
11. Install the replacement door assembly in the exact reverse order of removal.

    CAUTION: Prior to mechanism shield replacement, align the mechanism assembly valve and sensor pins.

12. Install the mechanism shield in the exact reverse order of removal.
13. Replace the mechanism assembly in the exact reverse order of removal.
14. Assemble the pump module assembly front and rear enclosures in the exact reverse order of separation.
15. Assemble the control module and pump module assemblies in the exact reverse order of separation.
16. Connect the XL3 infusion system to AC (mains) power.

To verify successful door assembly and mechanism shield replacement, perform the PVT in *Section 5.2.*

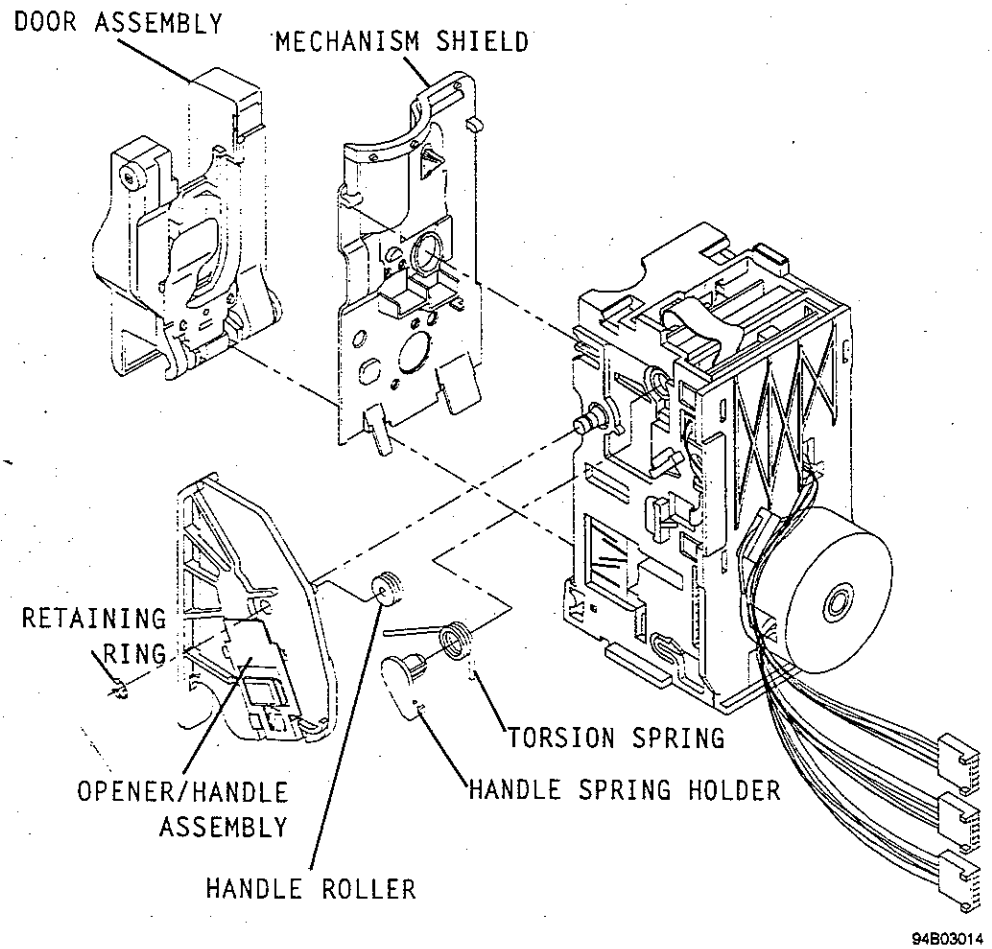

Figure 7-10. Door Assembly Exploded View

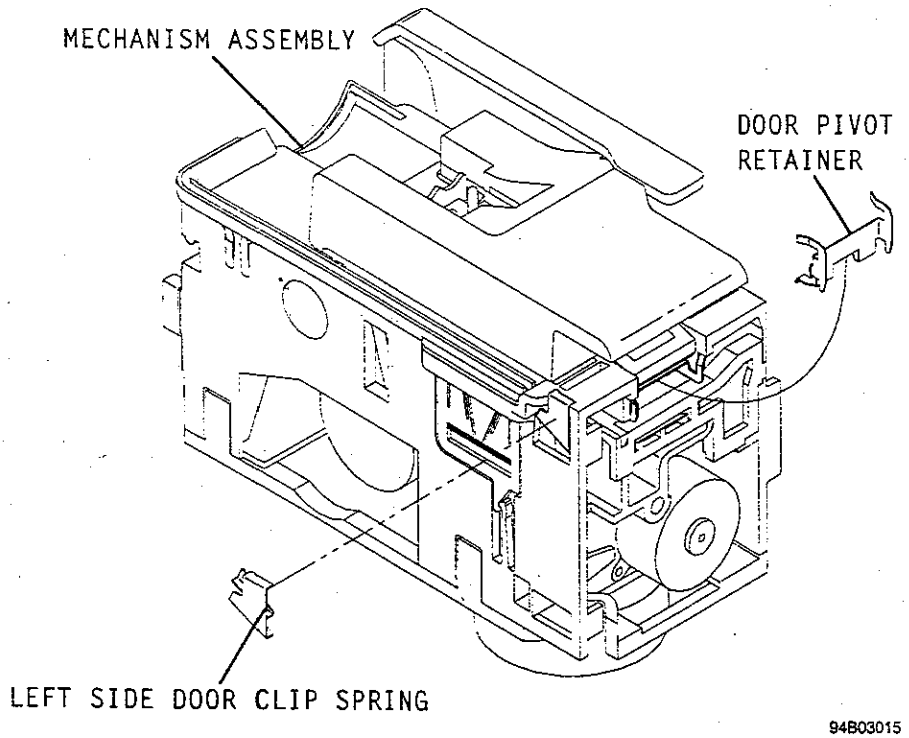

Figure 7-11. Mechanism Assembly Bottom View

7.2.18

OPENER/HANDLE ASSEMBLY REPLACEMENT

Recommended tools for this procedure are as follows: small size flat blade screwdriver and medium size flat blade screwdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the opener/handle assembly, refer to *Figure 7-10, Door Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
4. Separate the pump module assembly front and rear enclosures as described in *Section 7.2.10, Pump Module Assembly Front and Rear Enclosure Assembly Replacement.*
5. Identify the mechanism assembly to be removed (line A, line B, or line C). Remove the mechanism assembly as described in *Section 7.2.16, Pump Chassis Assembly, Mechanism Assembly, and Sensor Cable Assembly Replacement.*
6. Position the mechanism assembly to access the door assembly. Open and disengage the door assembly from the opener handle. Close the opener/handle assembly.
7. Using a small size flat blade screwdriver, remove the retaining ring from the handle shaft.
8. Insert a medium size flat blade screwdriver at the pry point between the opener/handle assembly and the mechanism assembly. Pry the assemblies apart. Remove the door roller from the back side of the opener/handle assembly as the opener/handle assembly is removed.

   Note: Door pivot retainer and torsion spring may fall free.

9. Inspect the roller and retaining ring for damage; replace if necessary.
10. Install the replacement opener/handle assembly in the exact reverse order of removal. Confirm the alignment of the marks; refer to *Figure 7-11, Mechanism Assembly Bottom View.*
11. Replace the mechanism assembly in the exact reverse order of removal.
12. Assemble the pump module assembly front and rear enclosures in the exact reverse order of separation.
13. Assemble the control module and pump module assemblies in the exact reverse order of separation.
14. Connect the XL3 infusion system to AC (mains) connector receptacle.

To verify successful opener/handle assembly replacement, perform the PVT in *Section 5.2.*

7.2.19

POLE CLAMP EXTRUSION, POLE CLAMP BACKING PLATE, AND ADHESIVE-BACKED INSULATOR REPLACEMENT

Recommended tools for this procedure are as follows: 5/16 inch nutdriver and isopropyl alcohol.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To replace the pole clamp extrusion, pole clamp backing plate, and adhesive-backed insulator, refer to *Figure 7-6, Pump Module Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Remove the battery door and batteries as described in *Section 7.2.4, Battery Assembly, Battery Door, and Battery Door Pad Replacement.*
4. Separate the control module and pump module assemblies as described in *Section 7.2.7, Control/Pump Module Assembly Separation.*
5. Separate the pump module assembly front and rear enclosures as described in *Section 7.2.10, Pump Module Assembly Front and Rear Enclosure Assembly Replacement.*
6. Remove the adhesive-backed insulator. Using the 5/16 inch nutdriver, remove the two hex head screws securing the pole clamp backing plate to the pole clamp extrusion.
7. Using isopropyl alcohol, clean the pump module assembly rear enclosure. Dry the enclosure thoroughly.
8. Install the replacement pole clamp extrusion, pole clamp backing plate, and adhesive-backed insulator in the exact reverse order of removal.
9. Assemble the pump module assembly front and rear enclosures in the exact reverse order of separation.
10. Assemble the control module and pump module assemblies in the exact reverse order of separation.
11. Replace the battery door and batteries in the exact reverse order of removal.
12. Connect the XL3 infusion system to AC (mains) power.

To verify successful pole clamp extrusion, pole clamp backing plate and adhesive-backed insulator replacement, perform the PVT in *Section 5.2.*

7.2.20

POLE CLAMP SHAFT/KNOB ASSEMBLY AND POLE CLAMP SHAFT TIP REPLACEMENT

The recommended tool for this procedure is wide head pliers.

To replace the pole clamp shaft/knob assembly and the pole clamp shaft tip, refer to *Figure 7-6, Pump Module Assembly Exploded View*, then proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Turn the pole clamp shaft/knob assembly counterclockwise to remove the pole clamp shaft/knob assembly from the pole clamp extrusion and loosen the pole clamp shaft tip from the pole clamp/shaft knob assembly.

   Note: The pole clamp shaft tip has a long shaft that is pressed into the threaded pole clamp shaft/knob assembly.

4. Turn the pole clamp shaft/knob assembly back into the pole clamp extrusion. Using wide head pliers, grasp the pole clamp shaft tip and remove.

   Note: If the pole clamp shaft tip is in good condition, reuse with replacement pole clamp shaft/knob assembly. If the pole clamp shaft tip is defective, replace.

5. Install the replacement pole clamp shaft/knob assembly into the pole clamp extrusion by turning the pole clamp shaft/knob assembly clockwise into the pole clamp extrusion until the threaded portion is visible.
6. Press the pole clamp shaft tip into the screw hole recess on the pole clamp shaft/knob assembly and turn the pole clamp shaft/knob assembly clockwise until the pole clamp shaft tip is secure against the pole clamp extrusion.
7. Connect the XL3 infusion system to AC (mains) power.

Replacement of the pole clamp shaft/knob assembly and the pole clamp shaft tip is a routine maintenance procedure and no verification procedure is normally required. However, if the XL3 infusion system may have been damaged during the pole clamp knob and tip insert replacement, perform the PVT in *Section 5.2*.

7.2.21

BAG HANGER ASSEMBLY REPLACEMENT

No tools are recommended for this procedure.

The bag hanger assembly replacement includes the replacement of the following components:

- ❑ Cotter ring
- ❑ Bag hanger
- ❑ Clutch housing
- ❑ Clutch spring

To replace the bag hanger assembly, refer to *Figure 7-12, Bag Hanger* Assembly, then perform the procedures in the following sections.

Note: The bag hanger assembly attaches to the XL3 infusion system through two holes in the pole clamp assembly and is held in place on the pole clamp assembly by a cotter ring. This cotter ring passes through a hole near the end of the longer of the two vertical rods on the bag hanger assembly and prevents the removal of the assembly from the pole clamp.

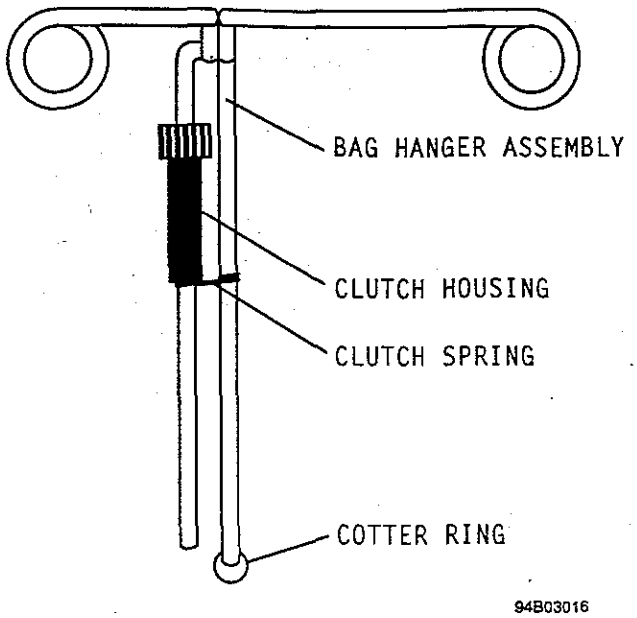

Figure 7-12. Bag Hanger Assembly

7.2.21.1

COTTER RING REPLACEMENT

To replace the cotter ring, proceed as follows:

1. Turn the rotary control knobs on line A, line B, and line C to OFF CHARGE.
2. Disconnect the XL3 infusion system from AC (mains) power.
3. Place the XL3 infusion system face down on a soft surface.
4. Grasp the cotter ring with thumb and finger. Twist, rotate, and remove the cotter ring from rod hole.
5. Replace the cotter ring in exact reverse order of removal.

Replacement of the cotter ring is a routine maintenance procedure and no verification procedure is normally required. However, if the XL3 infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2.*

7.2.21.2

BAG HANGER REPLACEMENT

To replace the bag hanger, proceed as follows:

1. Remove the cotter ring.
2. Remove the bag hanger from the pole clamp rod holes.
3. Insert the replacement bag hanger through the clamp rod holes.
4. Insert the cotter ring.

Replacement of the bag hanger is a routine maintenance procedure and no verification procedure is normally required. However, if the XL3 infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2.*

7.2.21.3

CLUTCH HOUSING REPLACEMENT

To replace the clutch housing, proceed as follows:

1. Remove the drug container hanger assembly from the XL3 infusion system.
2. Turn the clutch housing knob counterclockwise and remove.
3. Replace the clutch housing by turning the knob clockwise and sliding the clutch housing up the short rod. Confirm the clutch spring slides up the long rod.

Replacement of the clutch housing is a routine maintenance procedure and no verification procedure is normally required. However, if the XL3 infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2.*

7.2.21.4

CLUTCH SPRING REPLACEMENT

To replace the clutch spring, proceed as follows:

1. Remove the clutch housing as described in *Section 7.2.21.3, Clutch Housing Replacement.*
2. Work clutch spring from clutch housing hole and replace with new spring.

Replacement of the clutch spring is a routine maintenance procedure and no verification procedure is normally required. However, if the XL3 infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2.*

Section 8

SPECIFICATIONS

PHYSICAL:	
Dimensions:	Approximately 34.93H x 30.99W x 19.05D centimeters (13.75H x 12.20W x 7.50D inches) (excluding pole clamp)
Weight:	Approximately 9.00 kilograms (20 pounds) (with batteries)
Casing:	High-impact plastic
ELECTRICAL:	
Power Requirements:	100-130 VAC, 47/63 Hz, less than 60 W
Power Cord:	Hospital-grade AC cord. 10 feet long, with transparent plug
Fuses:	1.0 A, 250 V, slow-blow
Battery:	Three sealed, rechargeable 8 V batteries, internal to XL3 infusion system. Accessible for ease of field replacement, with polarized connectors, labeled A, B, and C
Battery Operation:	A fully charged new battery provides approximately eight hours of operation at 125 mL/hr, or 1000 mL total volume delivered per XL3 infusion system line
Recharge:	The batteries charge whenever the XL3 infusion system is connected to AC power. If a line is turned to OFF CHARGE, a full recharge for that particular line battery takes approximately eight hours, longer if the line is operating
ENVIRONMENT:	
Operating Temperature:	10° to 40° C (50° to 104° F), 10% to 90% relative humidity
DELIVERY RATE RANGE:	
Primary, Secondary Mode:	1 to 999 mL/hr (in ml increments)
KVO:	1 mL/hr

DOSE LIMIT RANGE:

Primary, Secondary Mode:	1 to 9999 mL (in ml increments)

OCCLUSION RANGE:

Distal:	10 psig (+5 psig, -2 psig) (69 kPa (+34.5 kPa, -13.8 kPa))

Section 9
DRAWINGS

Figures 9-1 through *9-10* show the XL3 infusion system through illustrated parts breakdown (IPB), interconnect, and PWA schematic diagrams. *Table 9-1, Drawings*, lists drawings by figure number, title, and part number. *Table 9-2, IPB for the XL3 Infusion System*, identifies parts by index numbers that correlate to *Figure 9-1, IPB for the XL3 Infusion System*.

Note: Drawings and schematics in *Section 9* are provided as information only; drawings and schematics may not exactly reflect current product configuration.

Table 9-1. Drawings

Figure No.	Title	Part Number
9-1	IPB for the XL3 Infusion System	Not Applicable
9-2	Plum XL3 Interconnect Schematic (4 sheets)	249-94000
9-3	Plum XL3 Power Supply PWA Schematic	249-94020
9-4	Plum XL3 MCU PWA Schematic (2 sheets)	249-00530
9-5	Plum XL3 MCU Piggyback PWA Schematic	249-94017
9-6	Plum XL3 Display PWA Schematic	249-00531
9-7	Plum XL3 Sensor PWA Schematic	249-00538
9-8	Plum XL3 Bubble Sensor PWA Schematic	249-00536
9-9	Plum XL3 Pin Detector Flex Circuit Schematic	249-00539
9-10	Plum XL3 Motherboard PWA Schematic (3 sheets)	249-94016

Table 9-2. IPB for the XL3 Infusion System

Index No.	Nomenclature	Replacement Procedure
1	PWA, Motherboard	*Section 7.2.13*
2	PWA, Power Supply	*Section 7.2.11*
3	PWA, MCU Piggyback	*Section 7.2.12*
4	PWA, MCU	*Section 7.2.12*

Table 9-2. IPB for the XL3 Infusion System		
Index No.	**Nomenclature**	**Replacement Procedure**
5	PWA, Display	*Section 7.2.15.1*
6	Assembly, Cable, Display/MCU	*Section 7.2.15.1*
7	Assembly, Door	*Section 7.2.17*
8	Shield, Mechanism	*Section 7.2.17*
9	Assembly, Opener/Handle	*Section 7.2.18*
10	Assembly, Battery with Wire Harness	*Section 7.2.4*
11	Pad, Battery Support (Battery Door Pad)	*Section 7.2.4*
12	Door, Battery	*Section 7.2.4*
13	Insulator, Clip, Adhesive-Backed	*Section 7.2.19*
14	Plate, Backing, Pole Clamp	*Section 7.2.19*
15	Extrusion, Pole Clamp	*Section 7.2.19*
16	Tip, Shaft, Pole Clamp	*Section 7.2.20*
17	Assembly, Shaft/Knob, Pole Clamp	*Section 7.2.20*
18	Gasket, AC Receptacle	*Section 7.2.4*
19	Enclosure, Front, Pump	*Section 7.2.10*
20	Enclosure, Rear, Pump	*Section 7.2.10*
21	Assembly, Cable, Sensor	*Section 7.2.16*
22	Label, Front Panel	*Section 7.2.15.4*
23	Clip, Cord	*Section 7.2.9*
24	Knob, Front Panel (Rotary Control Knob)	*Section 7.2.15.3*
25	Washer, Knob	*Section 7.2.15.3*
26	Gasket, Knob	*Section 7.2.15.3*
27	Ring, Detent	*Section 7.2.15.3*
28	Detent, Knob	*Section 7.2.15.3*
29	Retainer, Snap Knob	*Section 7.2.15.3*

Table 9-2. IPB for the XL3 Infusion System		
Index No.	**Nomenclature**	**Replacement Procedure**
30	Chassis, Pump	*Section 7.2.10*
31	Enclosure, Front Control	*Section 7.2.8*
32	Enclosure, Rear, Control	*Section 7.2.8*
33	Gasket, Cover Access, Control	*Section 7.2.8*
34	Cover, Access, Control	*Section 7.2.5 through 7.2.7*
35	Cordset, Hospital Grade, Detachable, 10 Feet	*Section 7.2.7*
36	Assembly, Mechanism	*Section 7.2.16 through 7.2.18*
37	Gasket, Front/Rear, Control	N/A
38	Gasket, Front/Rear, Pump	*Section 7.2.10*
39	Plate, Interlock, Pump	*Section 7.2.8*
40	Plate, Backing, Control	*Section 7.2.8*
41	Chassis, Top, Sheet Metal, Control	*Section 7.2.8*
42	Chassis, Bottom, Sheet Metal, Control	N/A
43	Guide, Card	N/A
44	Assembly, Hanger, Drug Container (Bag Hanger Assembly)	*Section 7.2.21*
44A	Hanger, Drug Container (Bag Hanger)	*Section 7.2.21.2*
44B	Housing, Clutch	*Section 7.2.21.3*
44C	Spring, Clutch	*Section 7.2.21.4*
45	Ring, Cotter	*Section* 7.2.21.1
46	Disk, Interlock, Control	N/A
47	Foot, CS, LC175	*Section 7.2.3*
48	Retainer, Door Pivot	*Section 7.2.17*
49	Spring Door Clip, Left Side	*Section 7.2.17*
50	Key, Front Panel, Switch Activate (Key Insert)	*Section 7.2.15.2*

Table 9-2. IPB for the XL3 Infusion System		
Index No.	**Nomenclature**	**Replacement Procedure**
51	Roller, Handle	*Section 7.2.18*
52	Spring, Torsion	*Section 7.2.18*
53	Holder, Handle Spring	N/A
54	Ring, Retainer, .188 x .025, Stainless Steel	*Section* 7.2.18
55	Screw, 6-32 x .375, Hex-Head, Slotted, w/Washer	N/A
56	Screw, 6-32 x .25, Hex-Head, Slotted, w/Washer	N/A
57	Screw, 4-40 x .375, Hex-Head, Slotted, w/Washer	N/A
58	Washer, Flat, #6, .062 Thick, Nylon	N/A
59	Screw, 6-32 x .5, Pan-Head, Tri-Round	N/A
60	Screw, 6-32 x .375, Button-Head, Black Ox	N/A
61	Washer, Lock, #6, .031 Thick, SPL, C, Steel	N/A
62	Washer, Flat, #6, .032 Thick, Stainless Steel	N/A
63	Washer, Lock, #6, .031 Thick, SPL, C, Steel	N/A
64	Screw, 6-32 x 3.25, Pan-Head, PHH	N/A
65	Screw, 6-32 x .5, 8 Tin-Head, Hex Socket	N/A
66	Washer, Flat, .500 O.D., .030 Thick, Stainless Steel	N/A
67	Screw, 10-32 x .5, Hex-Head, Slotted, w/Washer	N/A
68	Nut, M6-1, Hex, Steel	N/A
69	Washer, Lock, 1/4, .025 Thick, INT, TTH	N/A
70	Terminal, Equipotential	N/A
71	Connector, Receptacle, AC, Panel Mount	*Section 7.2.14*
72	Fuse, T1 Amp, Metric	*Section 7.2.6*
73	Drawer, Fuse, 2 Pole	*Section 7.2.6*
74	Insulator, Adhesive-Backed	*Section 7.2.16*
75	Insulator, Main Board (Insulator)	*Section 7.2.13*

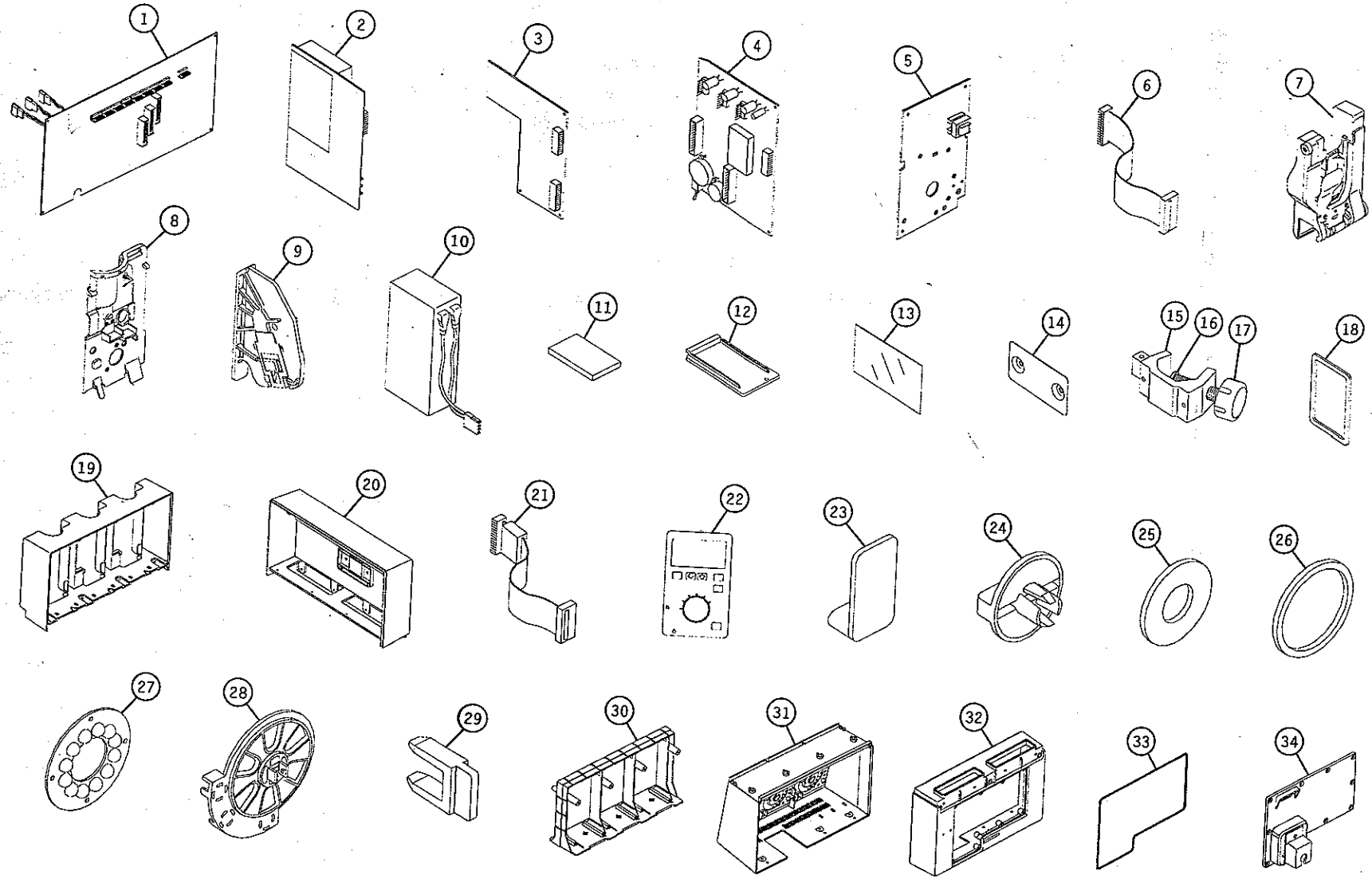

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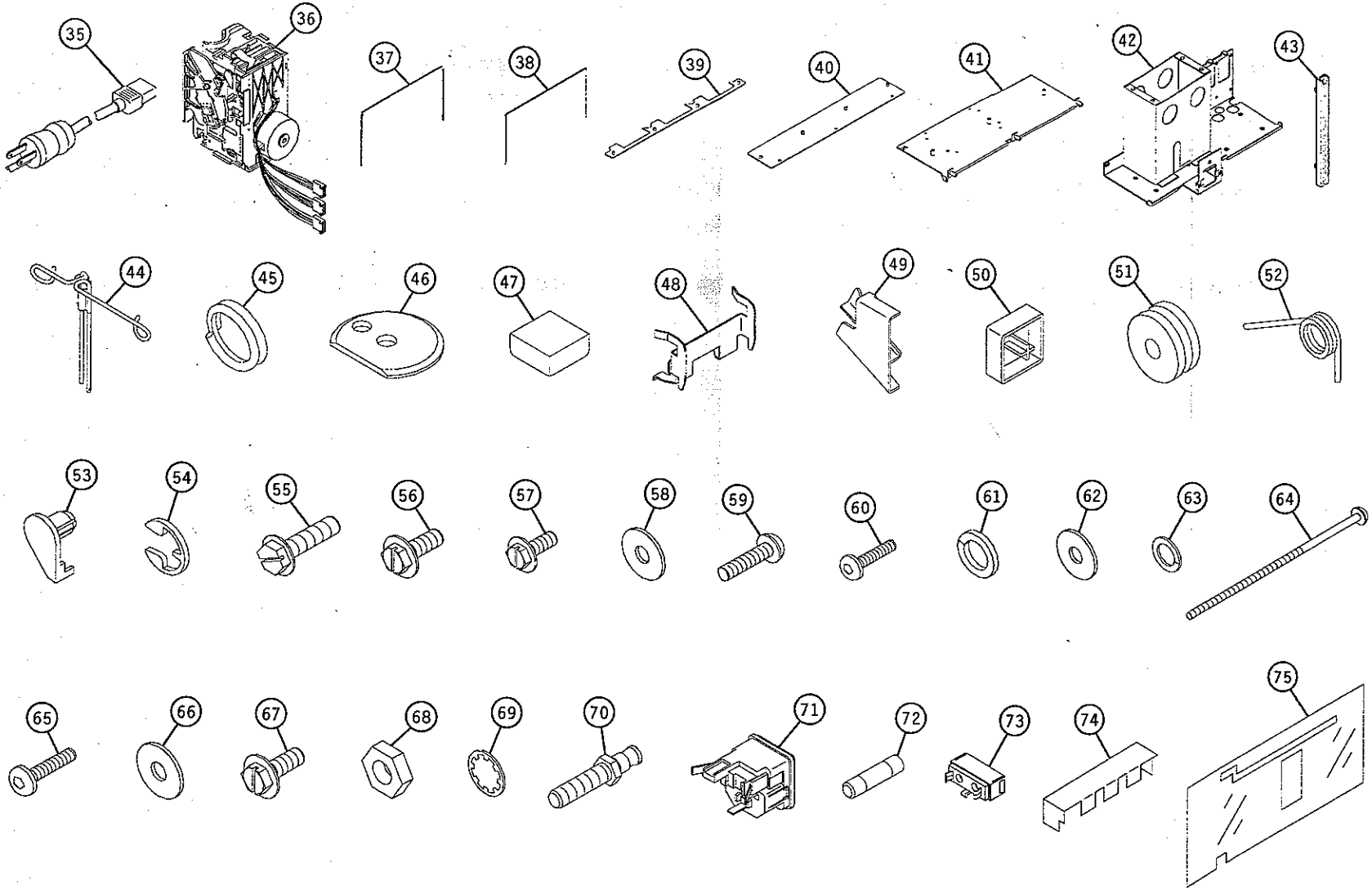
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A
	SHEET 1 OF 10



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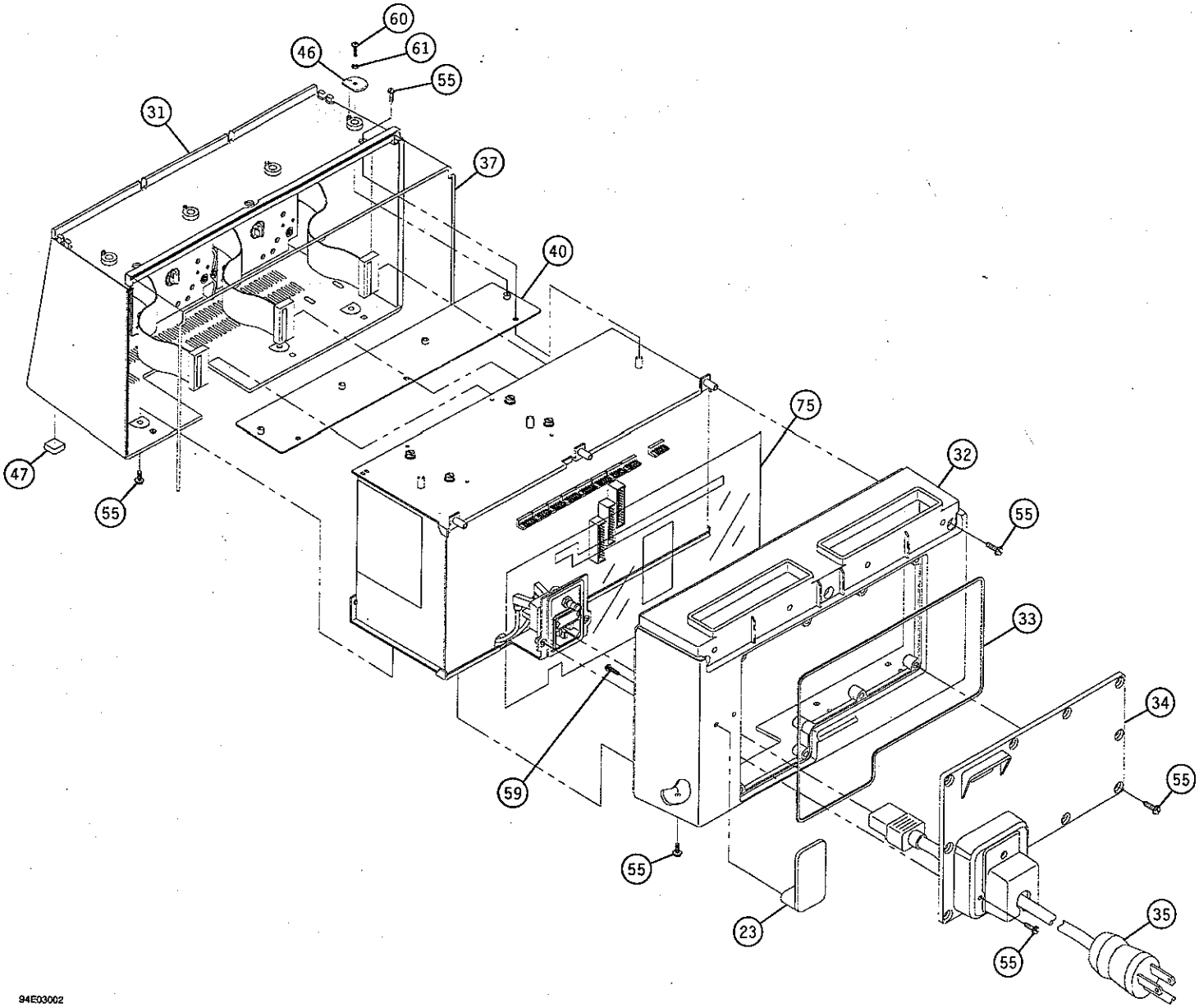
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A
	SHEET 2 OF 10



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ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
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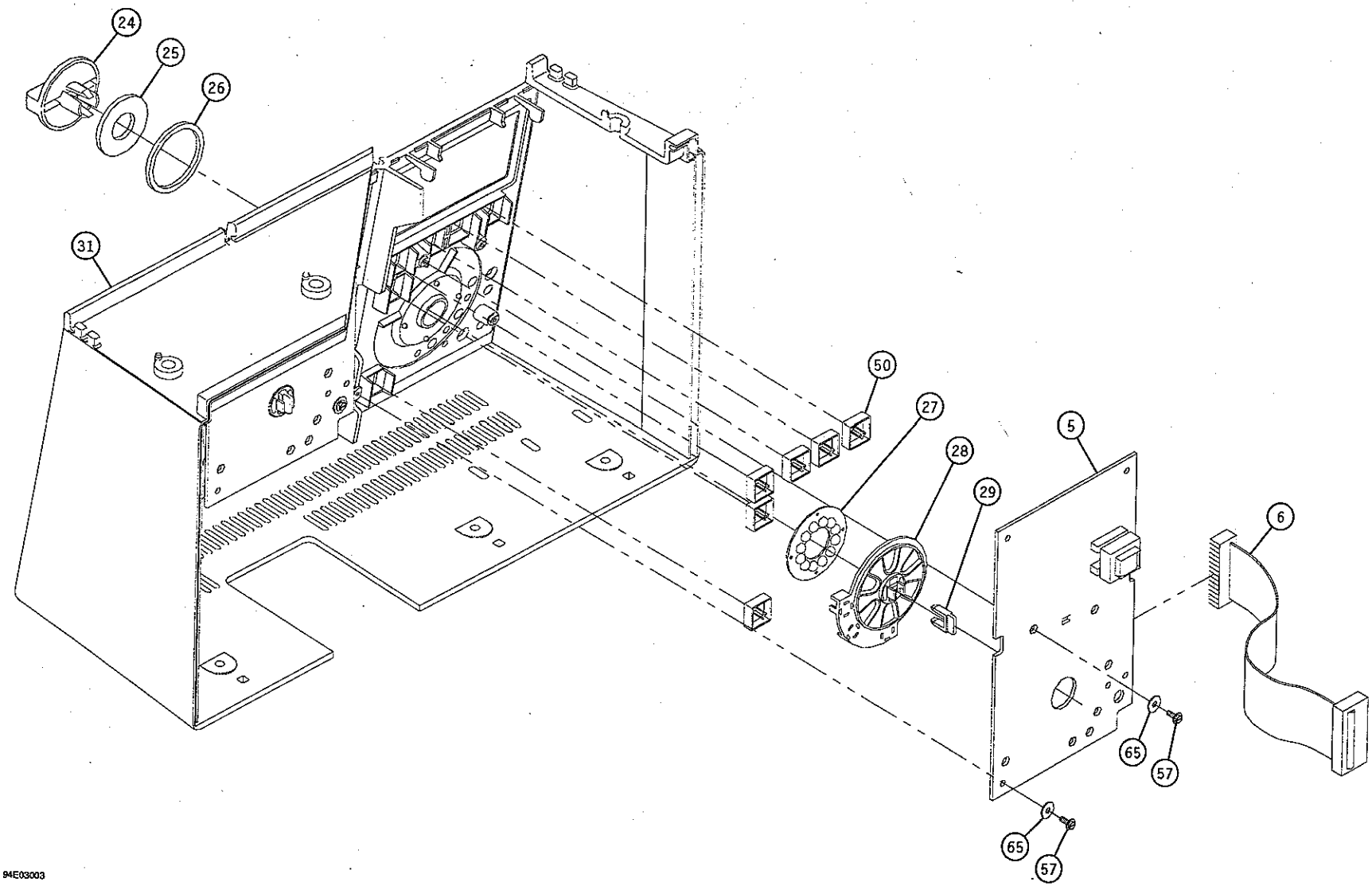

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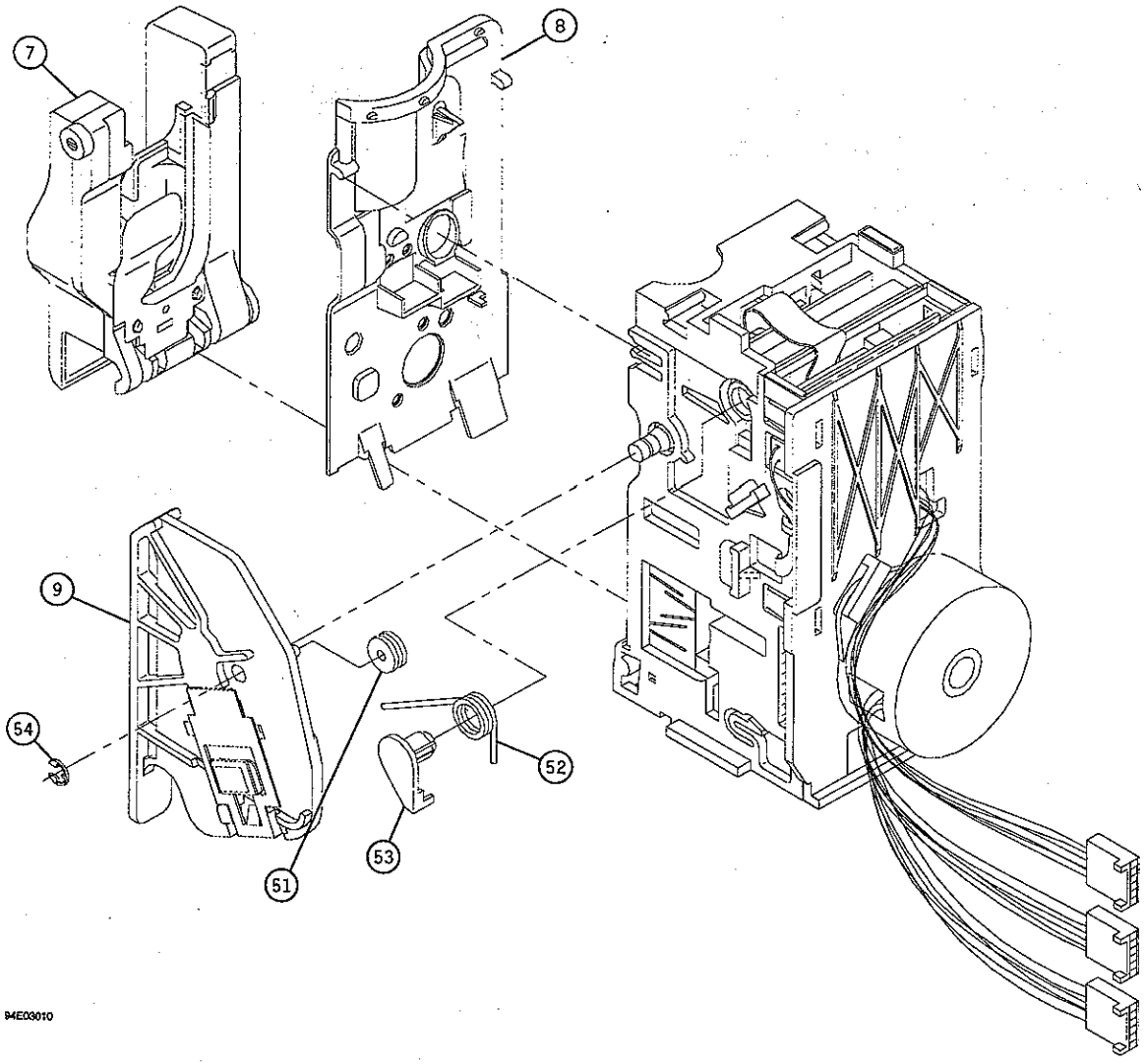
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A SHEET 4 OF 10



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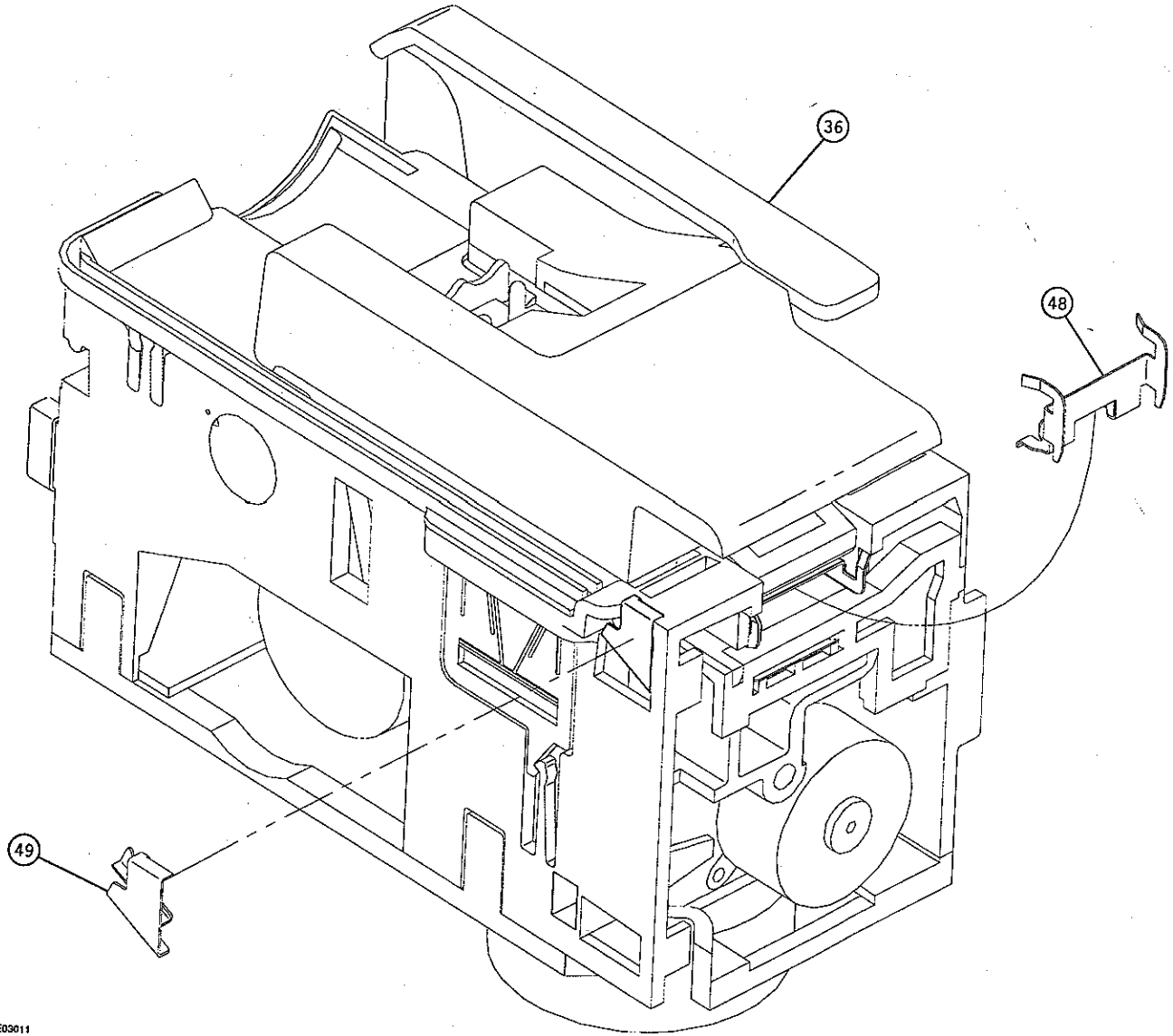
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A SHEET 5 OF 10



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ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
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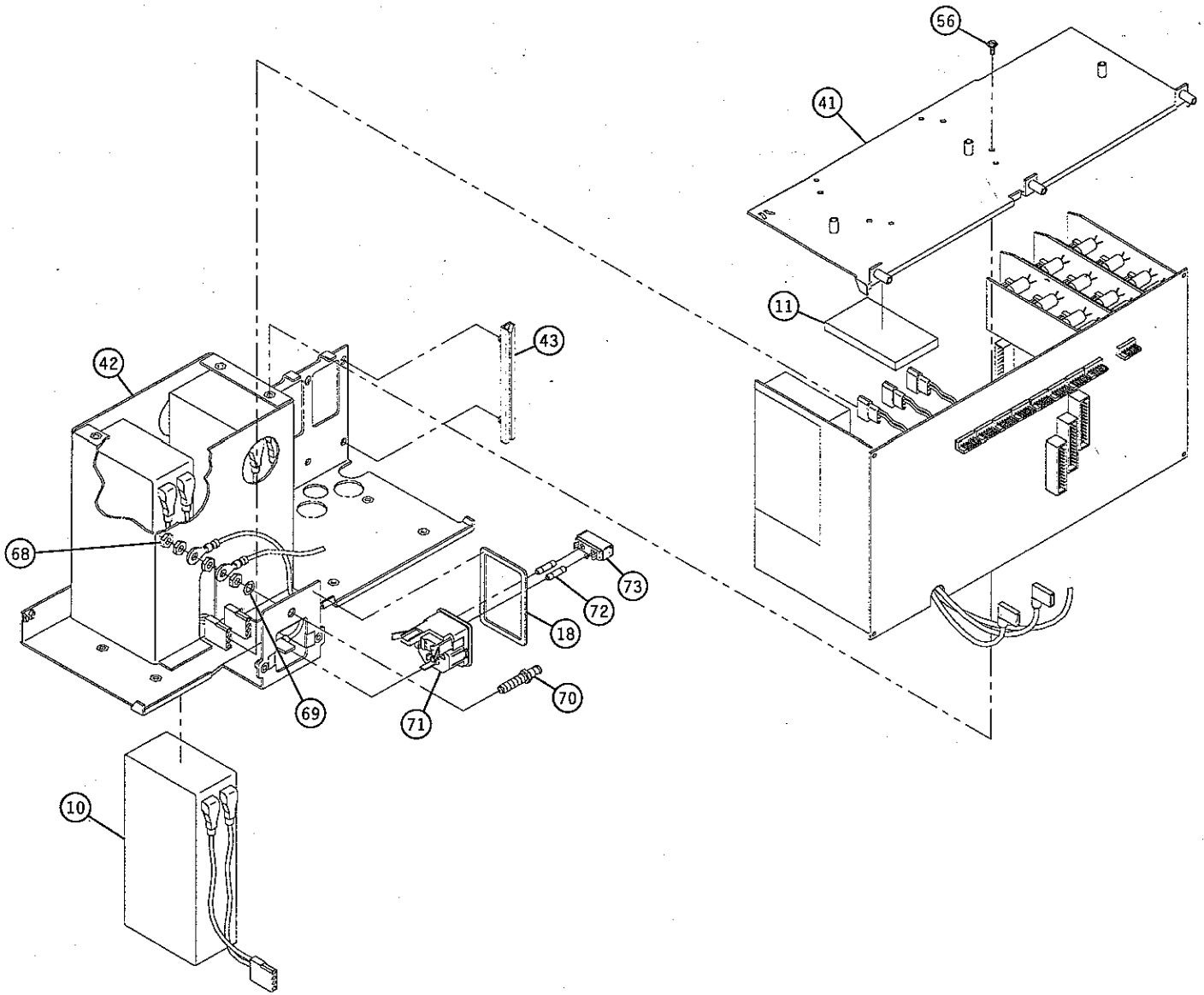
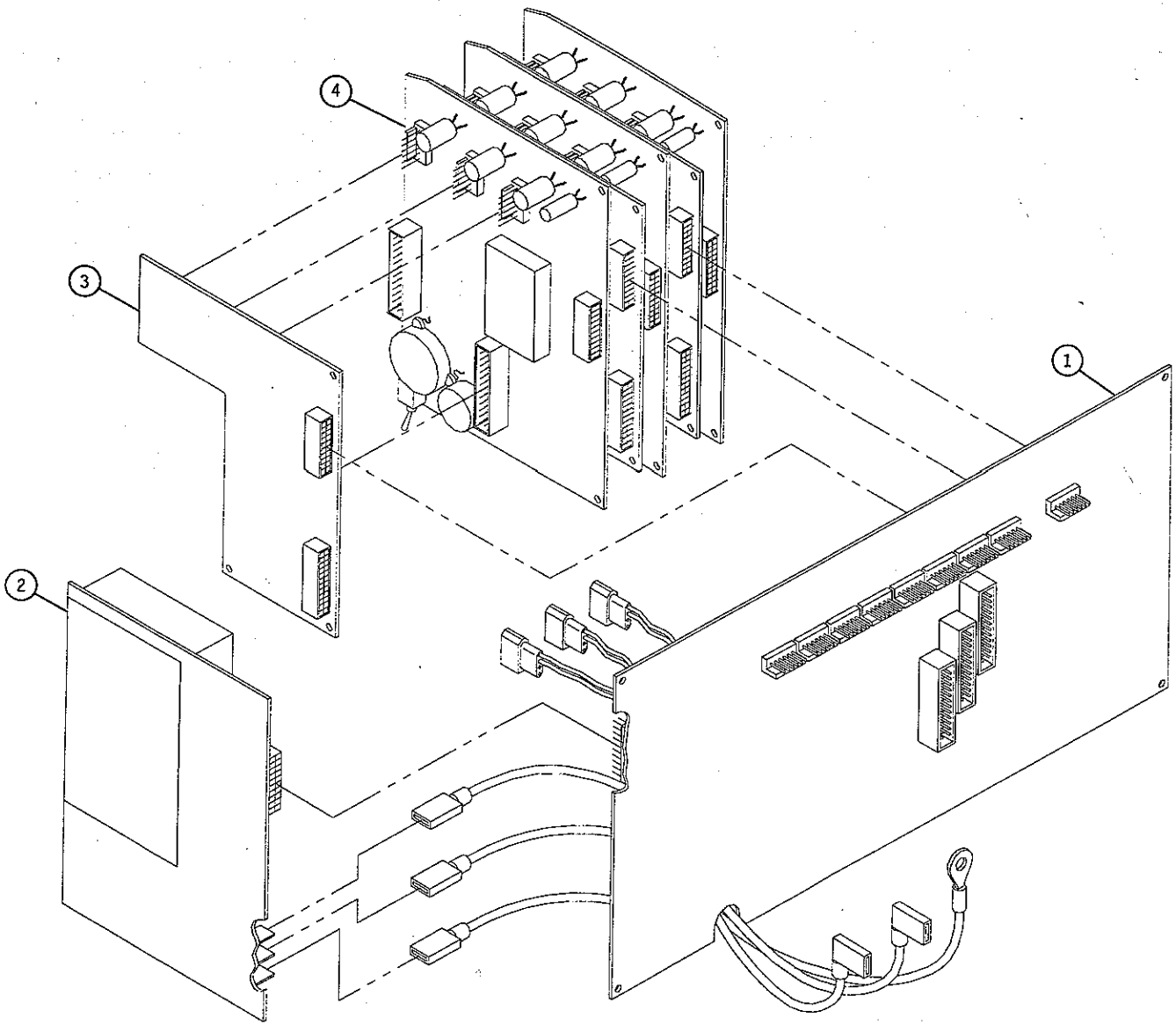
	SHEET 6 OF 10



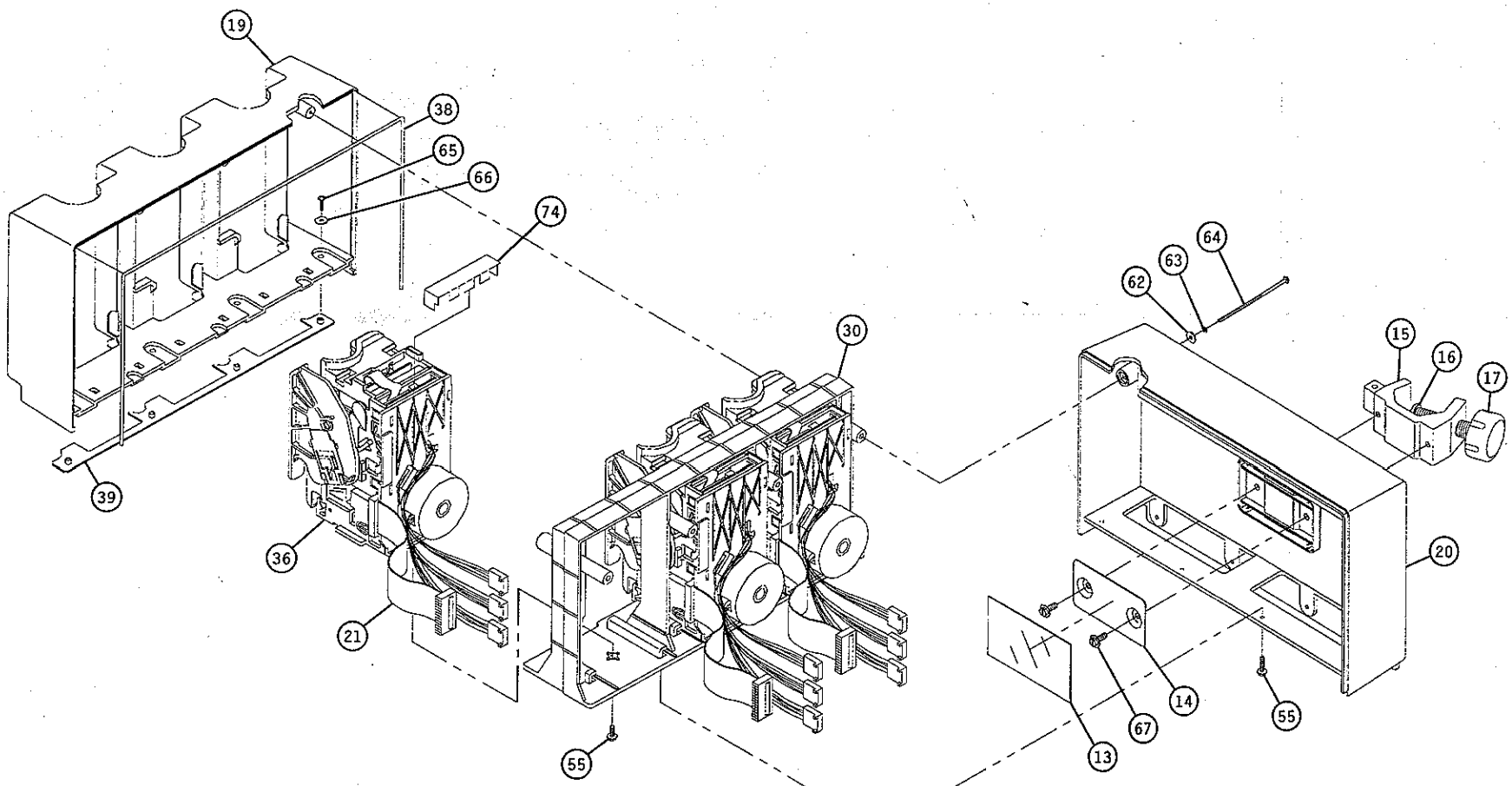
94E03012

ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A SHEET 7 OF 10



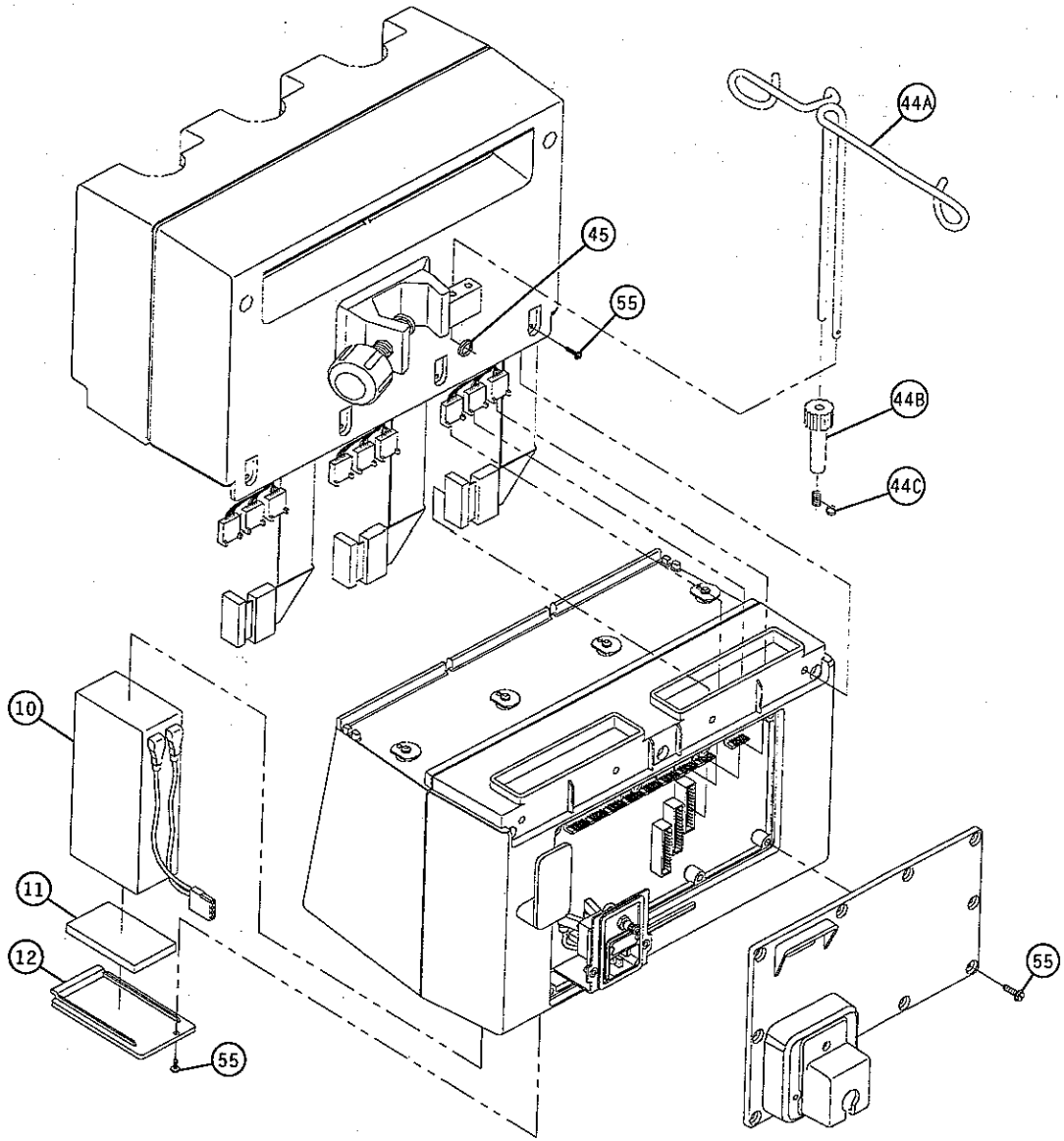
34E03013

ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A SHEET 8 OF 10



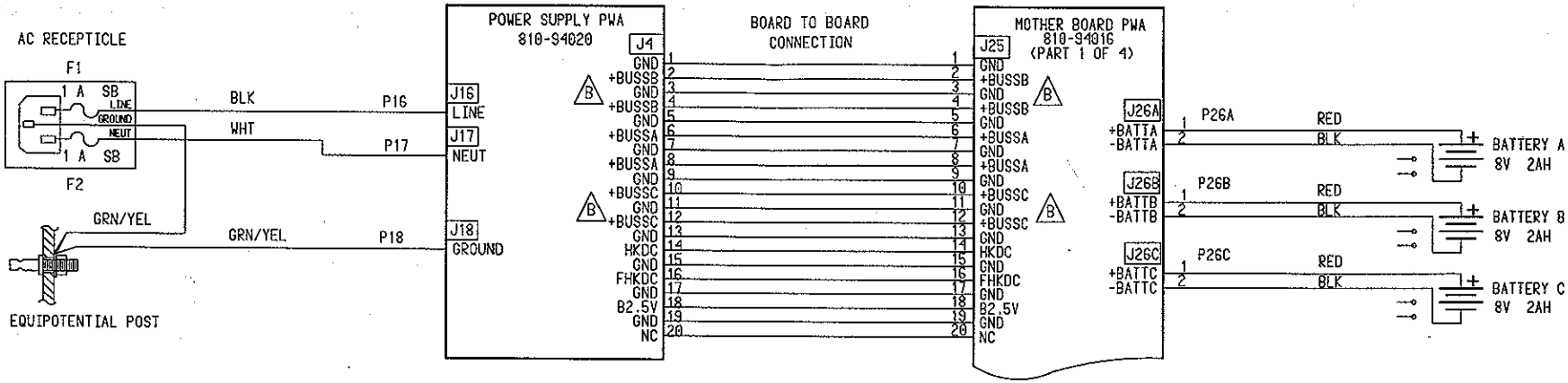
94E03014

ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A SHEET 9 OF 10



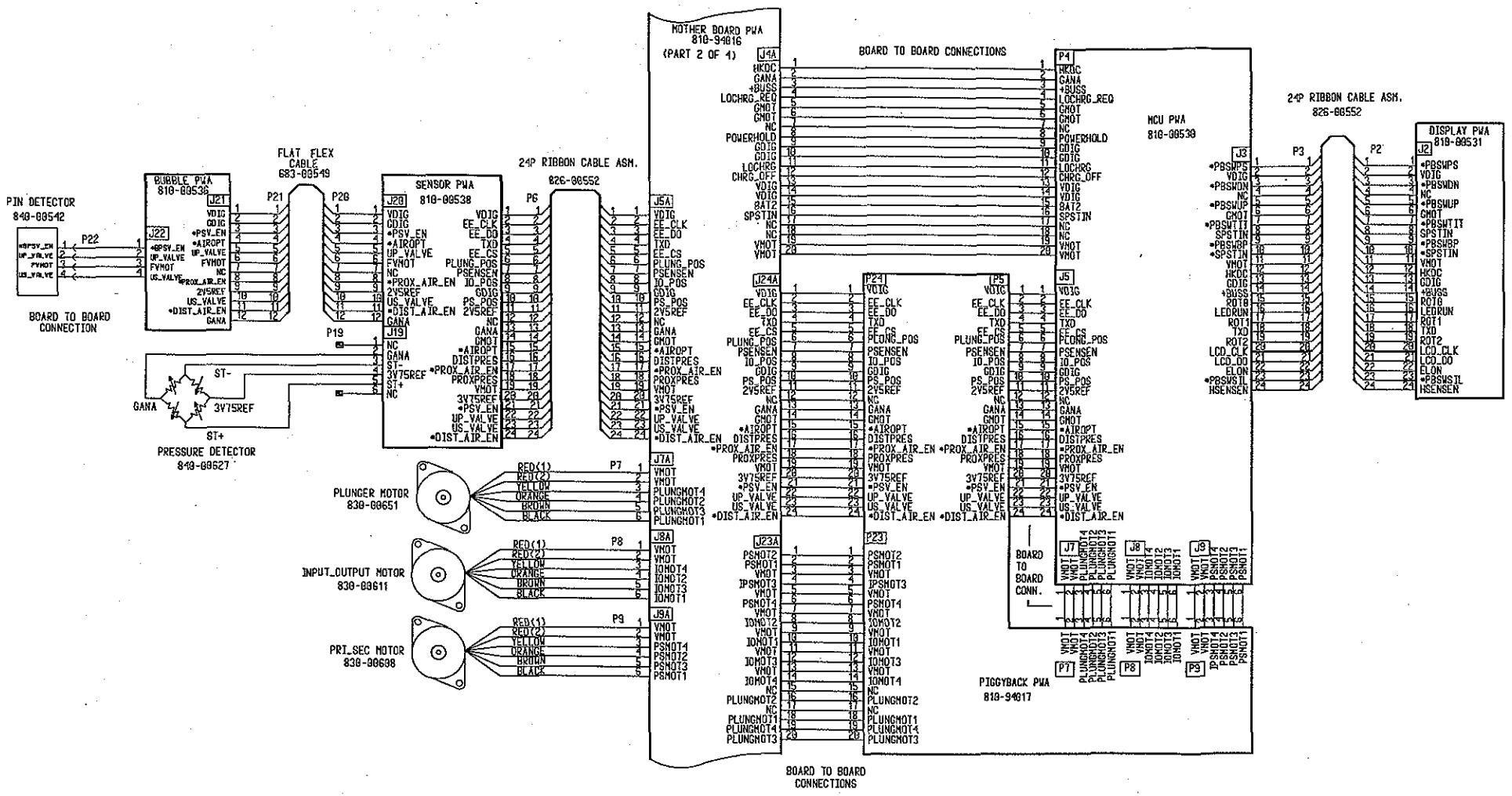
94E03015

ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-1. IPB for the XL3 Infusion System	
DRAWING NO. NOT APPLICABLE	REV. N/A
	SHEET 10 OF 10



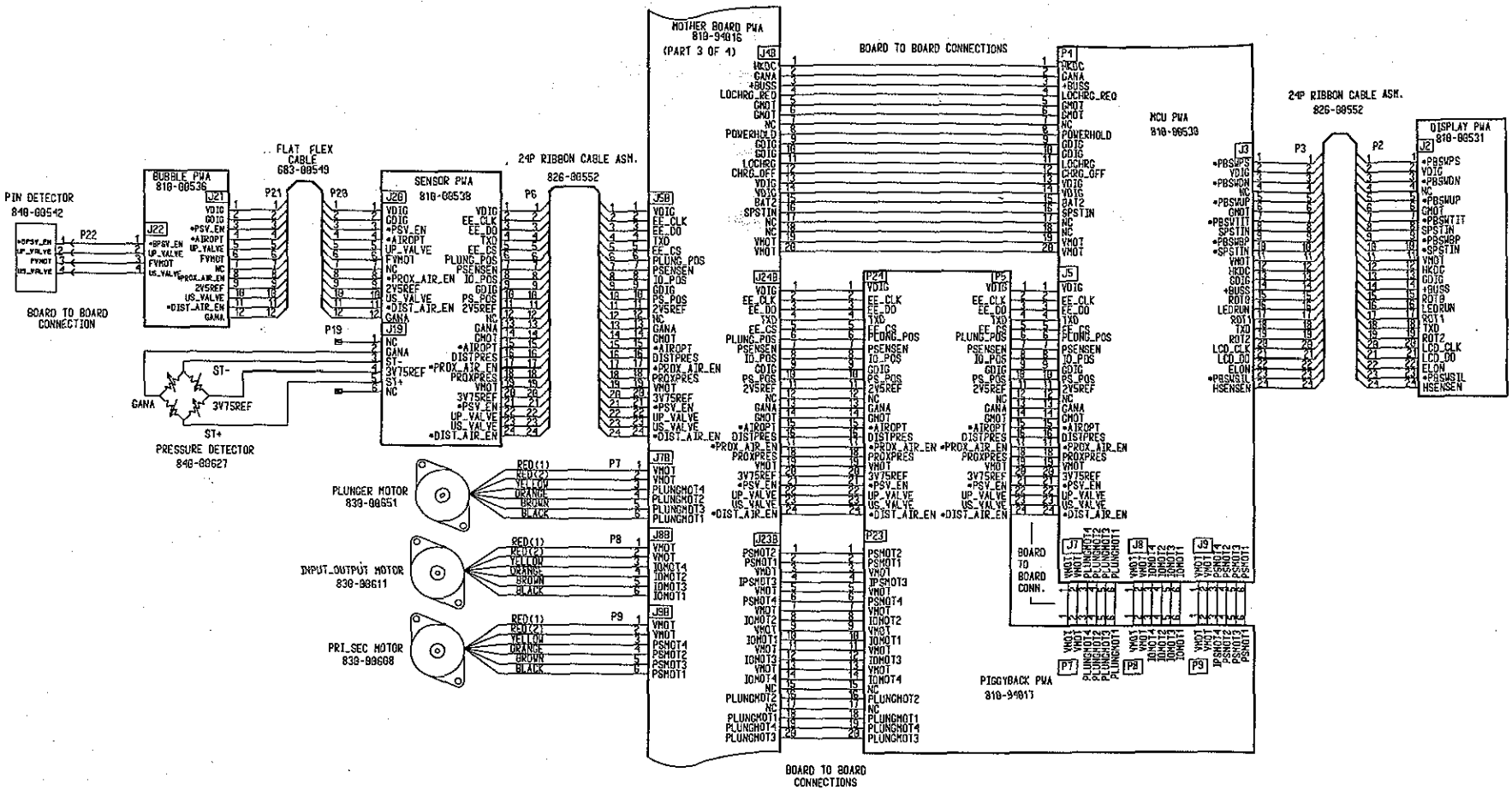
POWER SUPPLY AND BATTERIES

ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-2. Plum XL3 Interconnect Schematic	
DRAWING NO. 249-94000-001	REV. B
	SHEET 1 OF 4



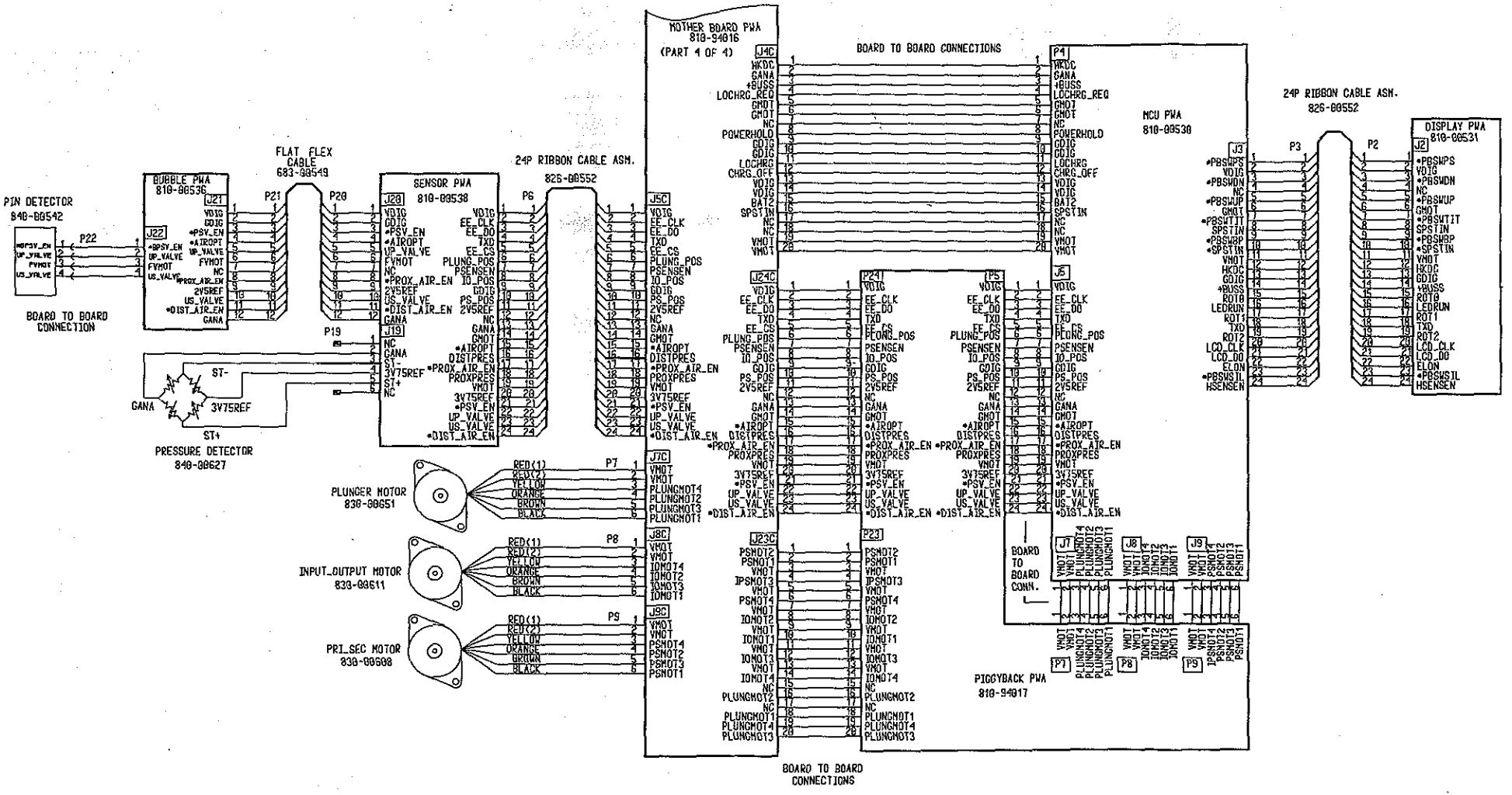
LINE A INTERCONNECT

ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-2. Plum XL3 Interconnect Schematic	
DRAWING NO. 249-94000-001	REV. B
	SHEET 2 OF 4



LINE B INTERCONNECT

ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-2. Plum XL3 Interconnect Schematic	
DRAWING NO.	REV. B
249-94000-001	SHEET 3 OF 4



ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-2. Plum XL3 Interconnect Schematic	
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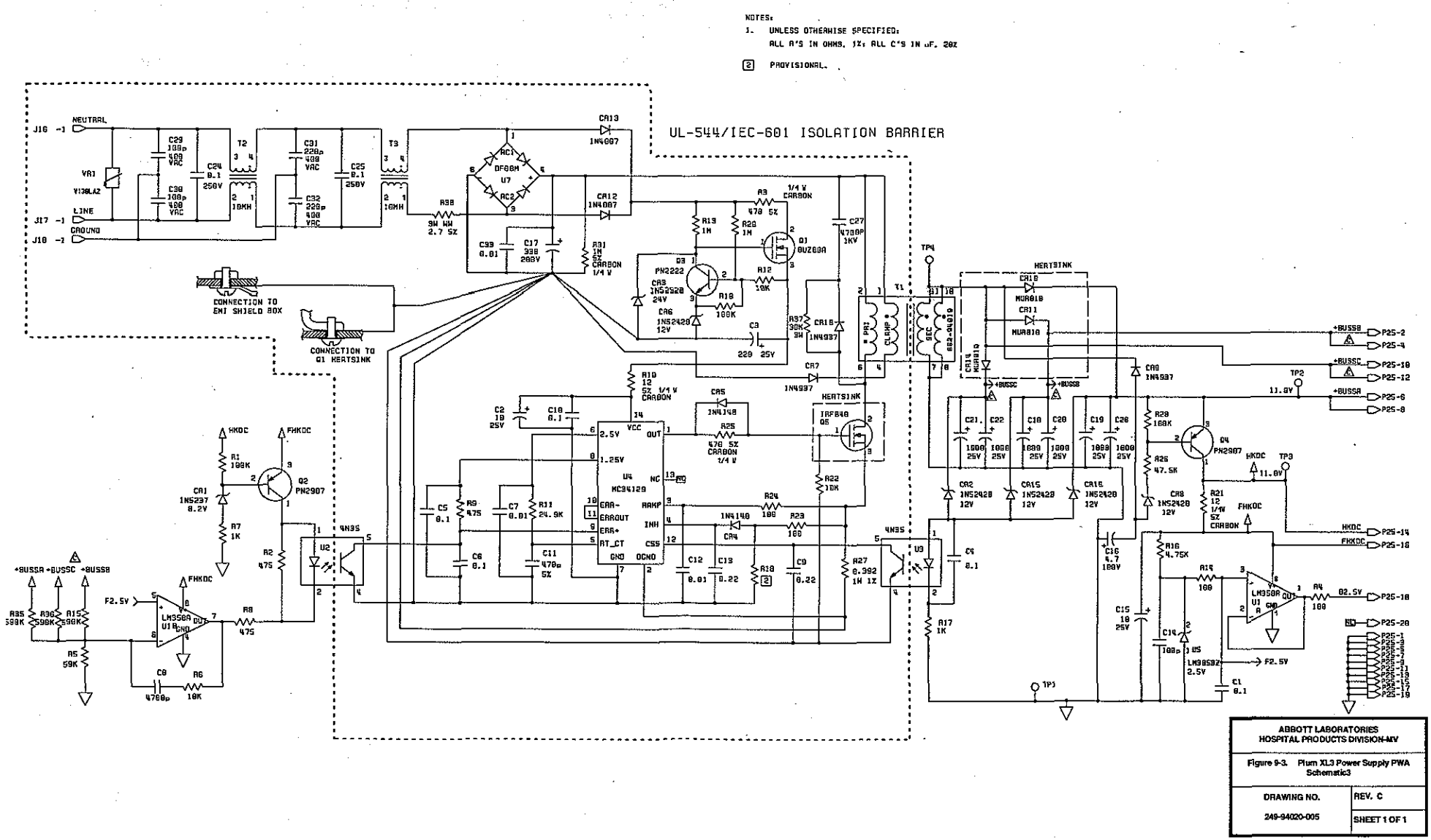
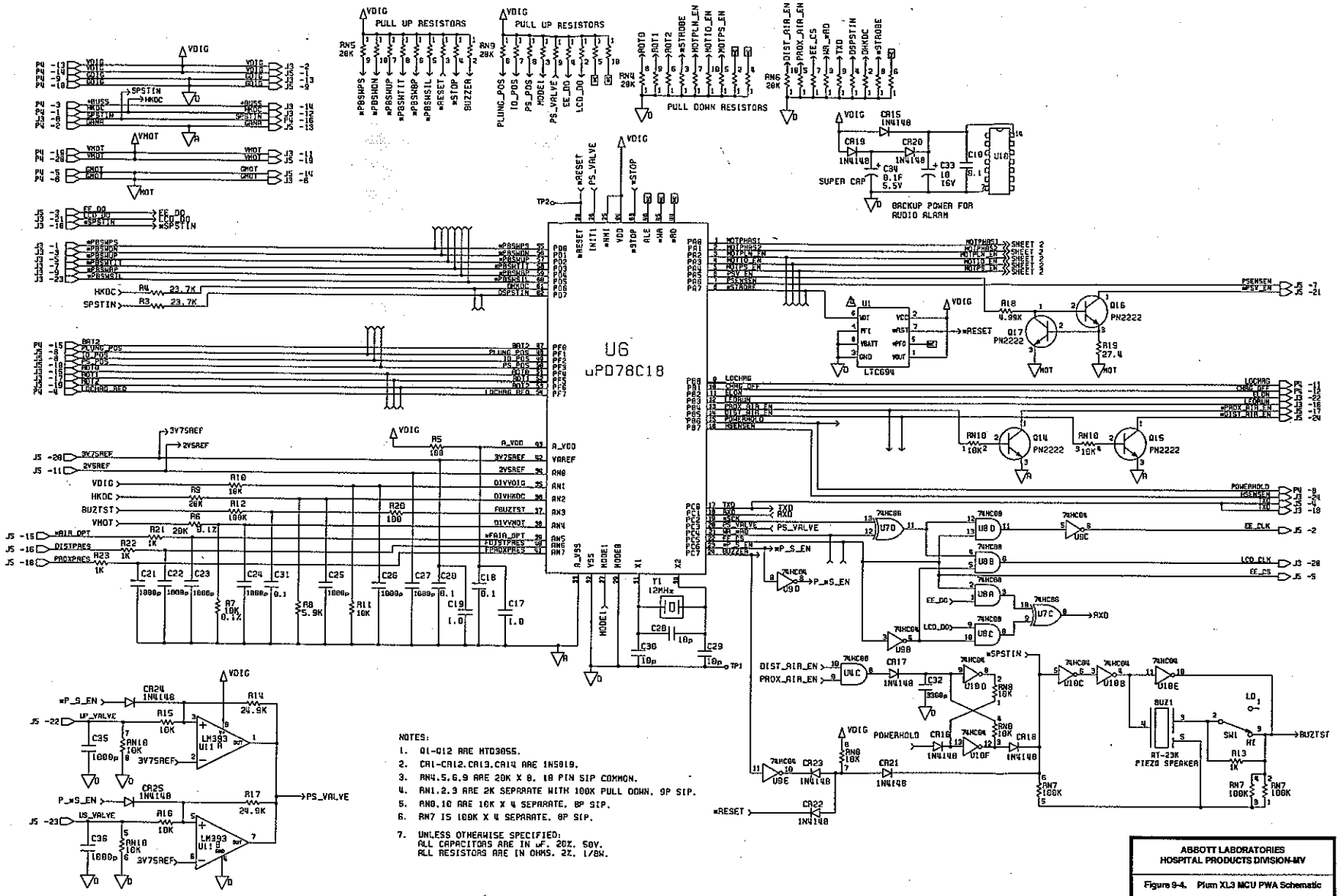
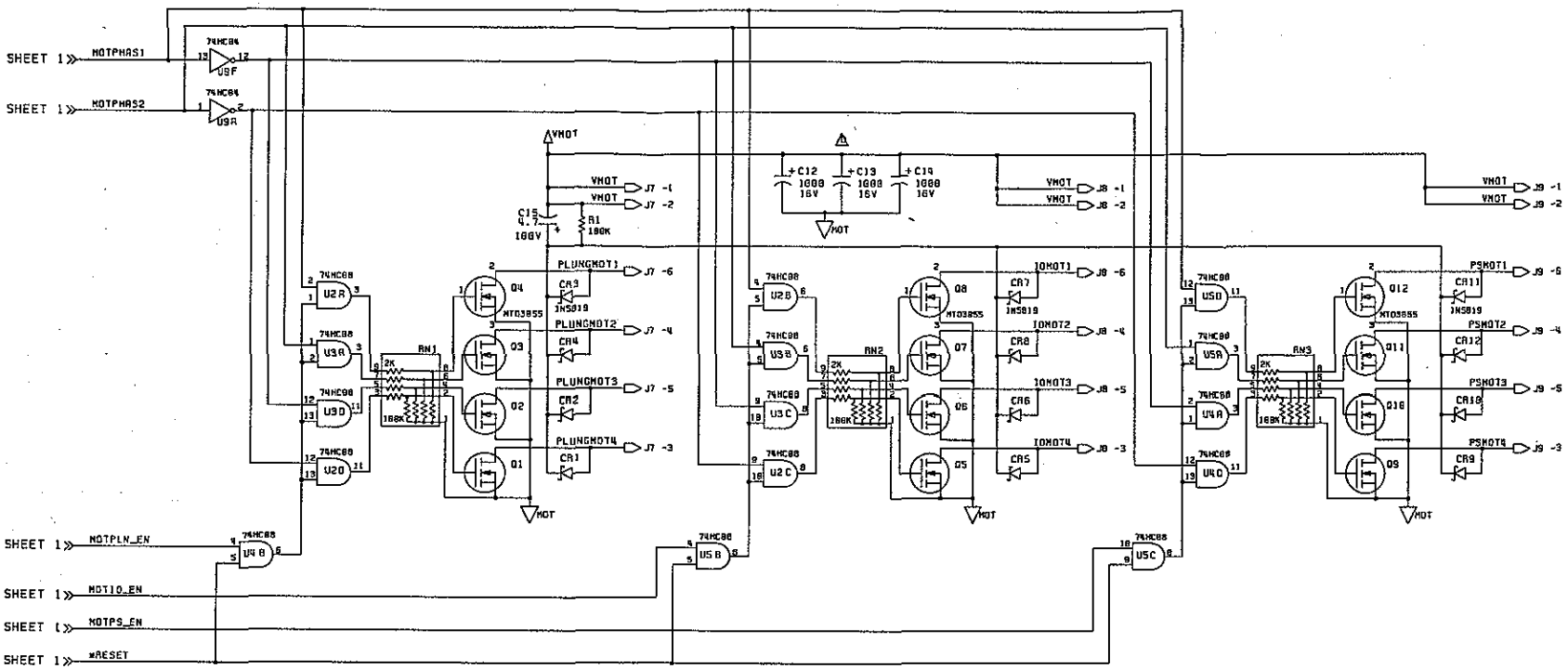
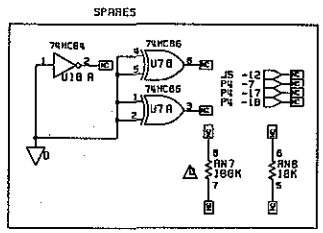


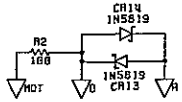
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-3. Plum XL3 Power Supply PWA Schematic3	
DRAWING NO. 249-94020-005	REV. C SHEET 1 OF 1

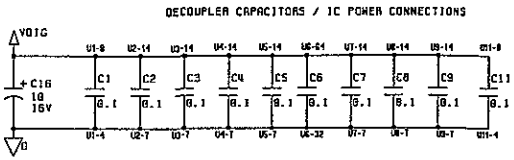


ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-4. Plum XL3 MCU PWA Schematic	
DRAWING NO. 249-00530-009	REV. F SHEET 1 OF 2

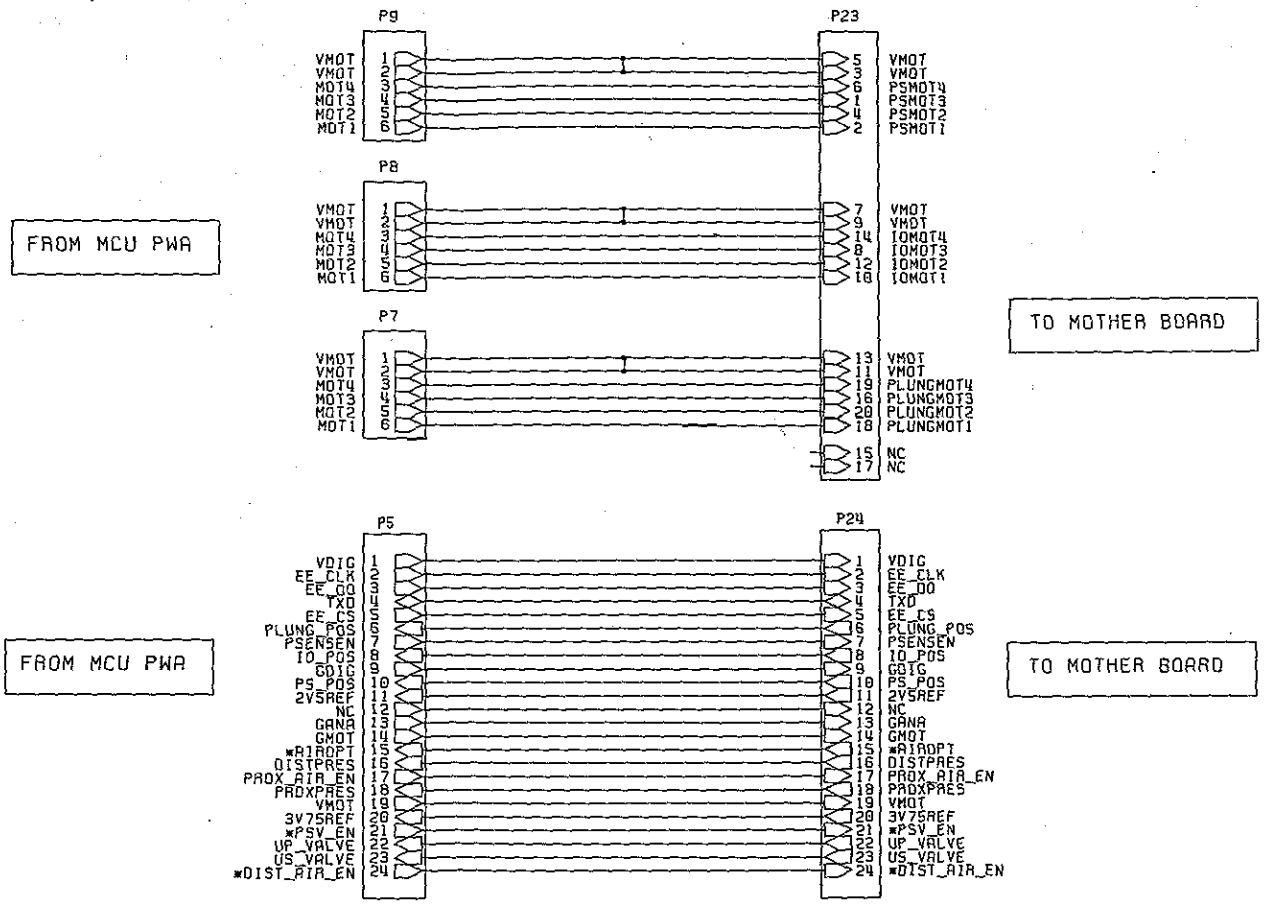








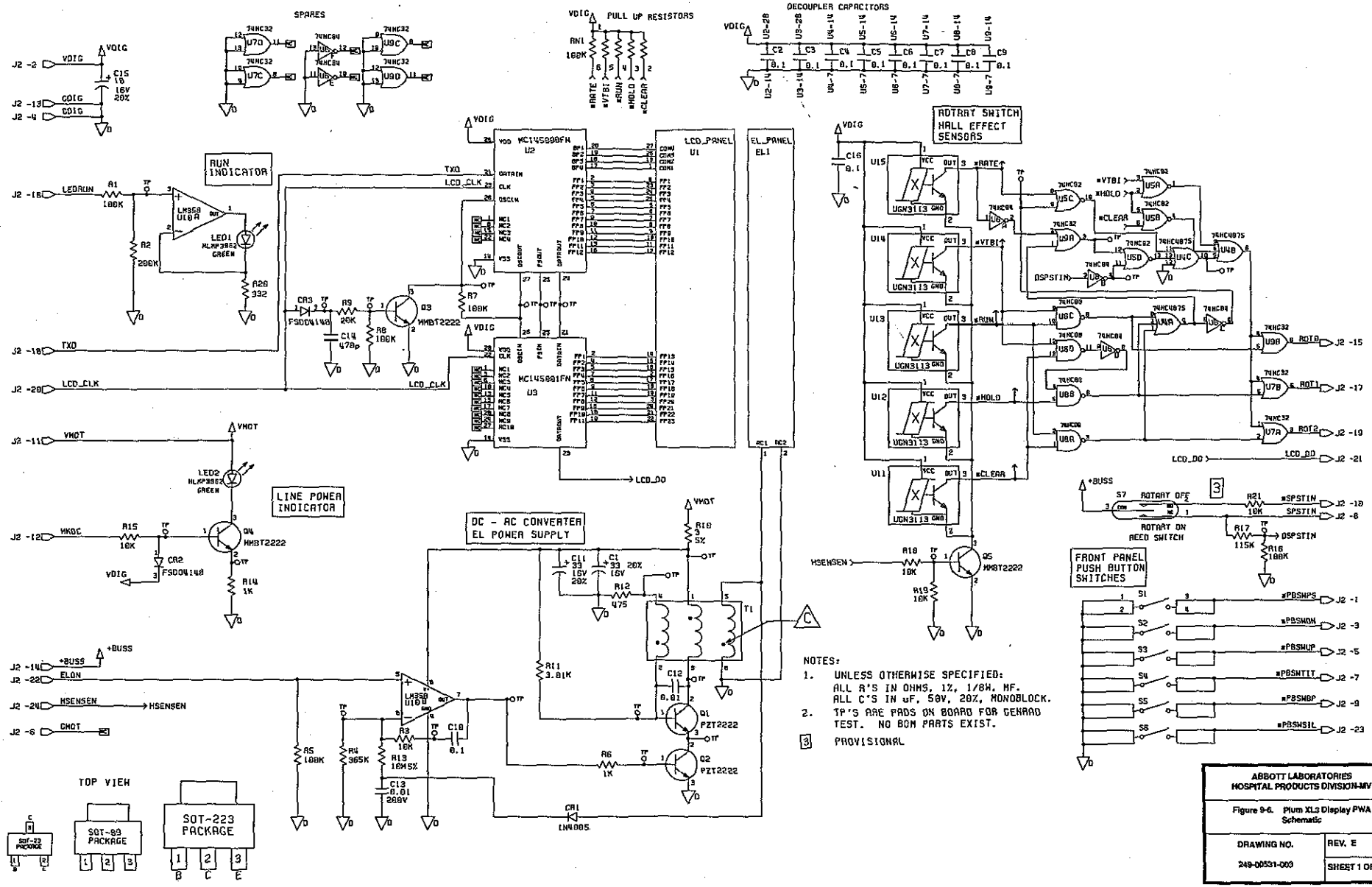
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-4. Plum XL3 MCU PWA Schematic	
DRAWING NO. 249-00530-009	REV. F SHEET 2 OF 2



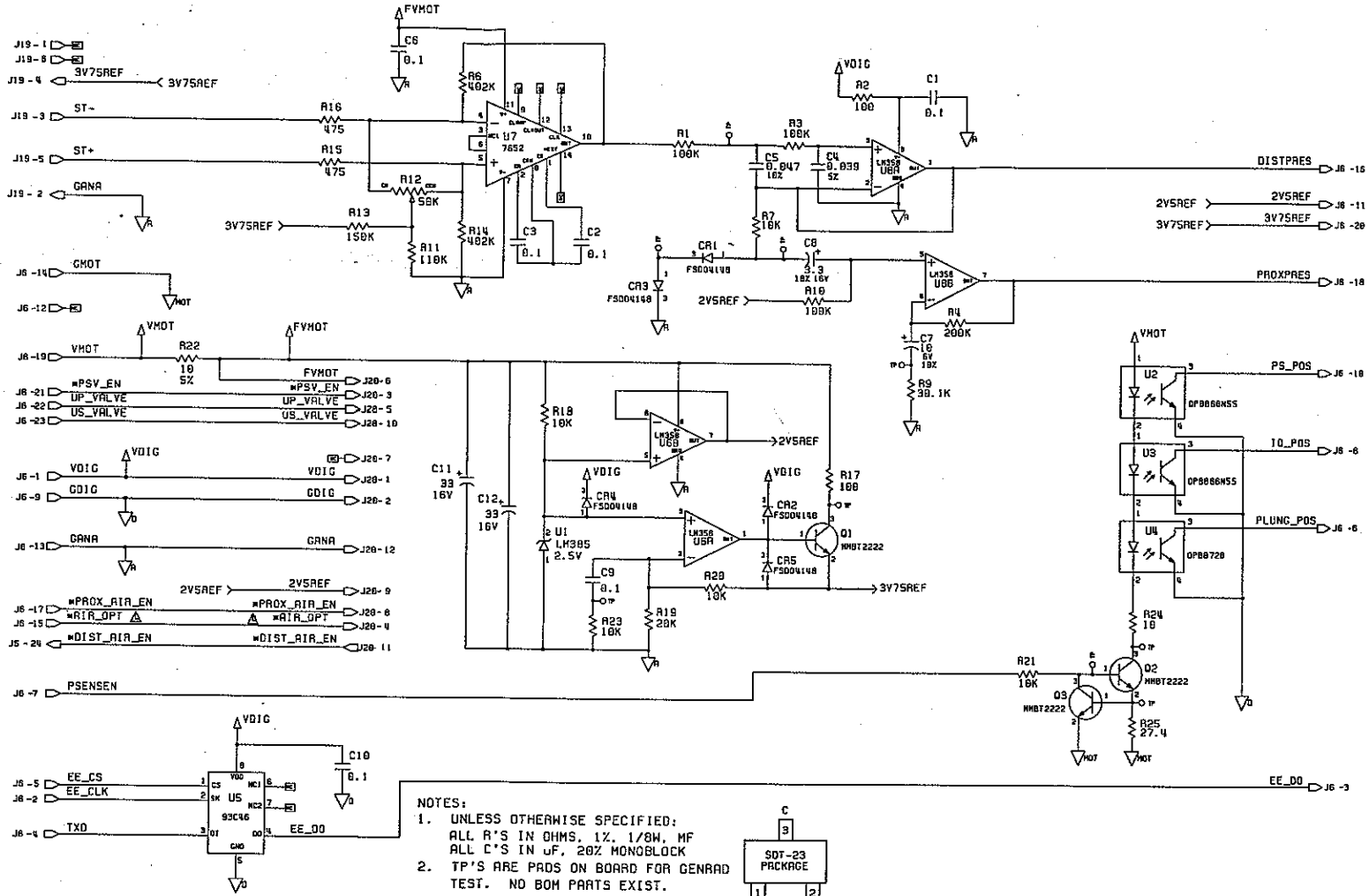
Notes: 3 PWA's "A" "B" & "C" IN A SYSTEM

SIGNAL NAMES WILL CHANGE TO REFLECT WHICH LINE IT IS OPERATING.

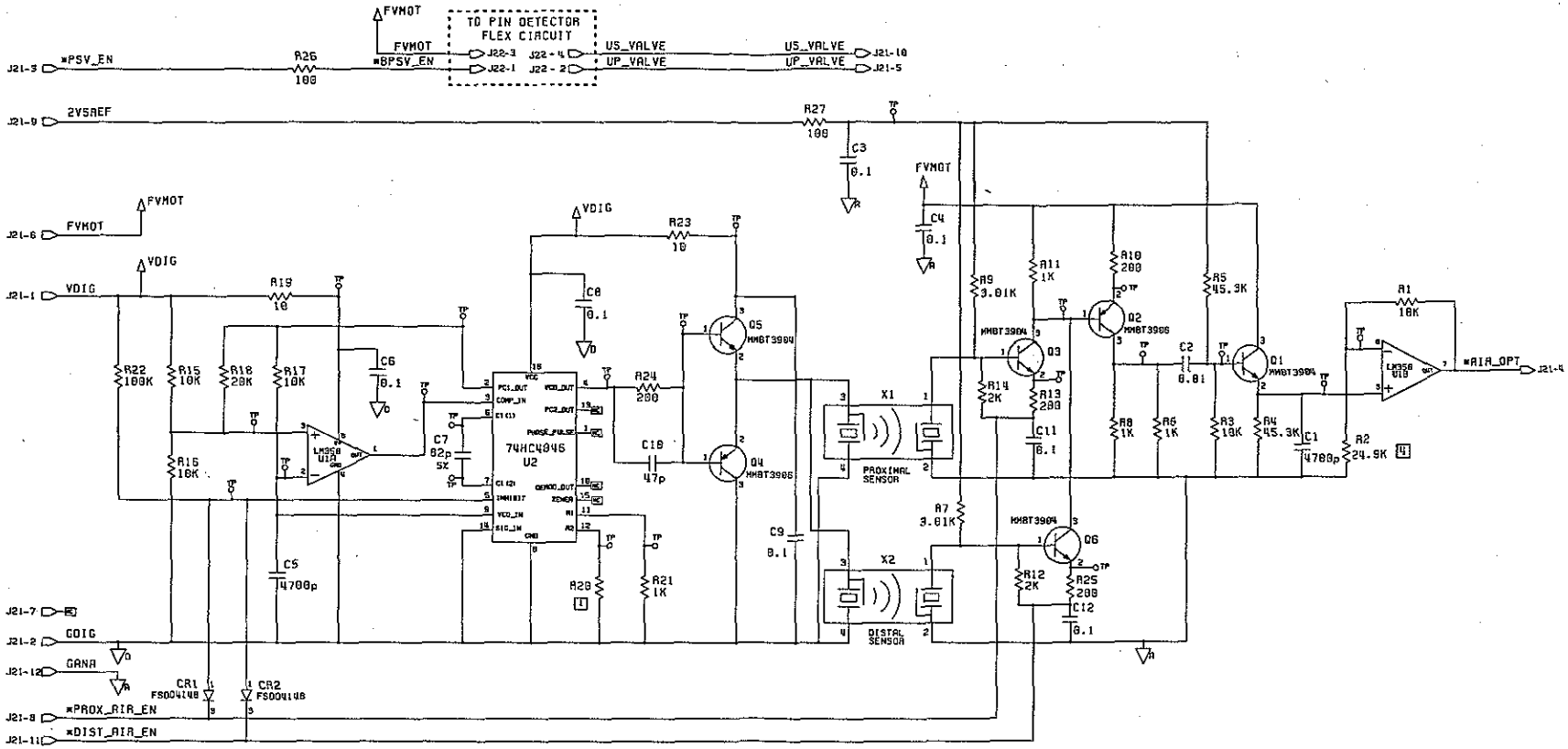
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-5. Plum XL3 MCU Piggyback PWA Schematic	
DRAWING NO. 243-94017-003	REV. B
	SHEET 1 OF 1



ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-6. Plum XL3 Display PWA Schematic	
DRAWING NO.	REV. E
249-00531-000	SHEET 1 OF 1

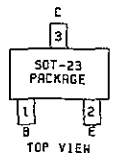


ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-7. Plum XL3 Sensor PWA Schematic	
DRAWING NO. 249-00538-002	REV. C SHEET 1 OF 1

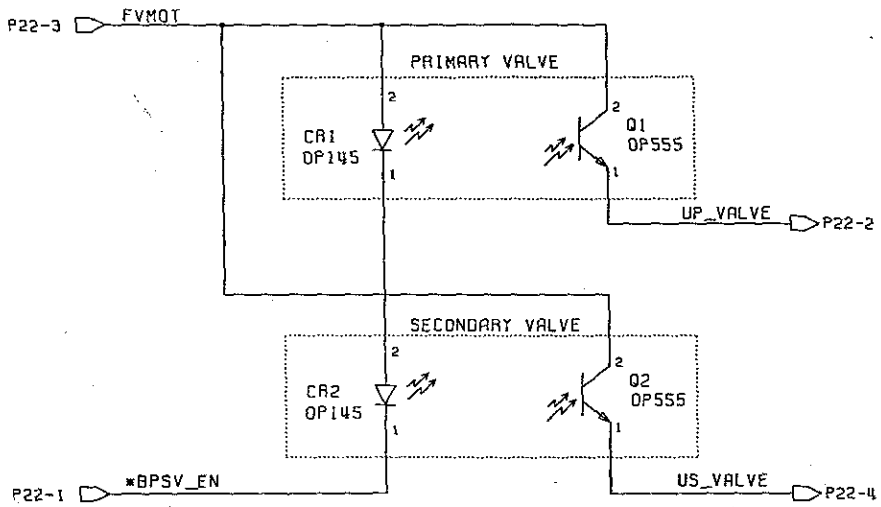


NOTES:

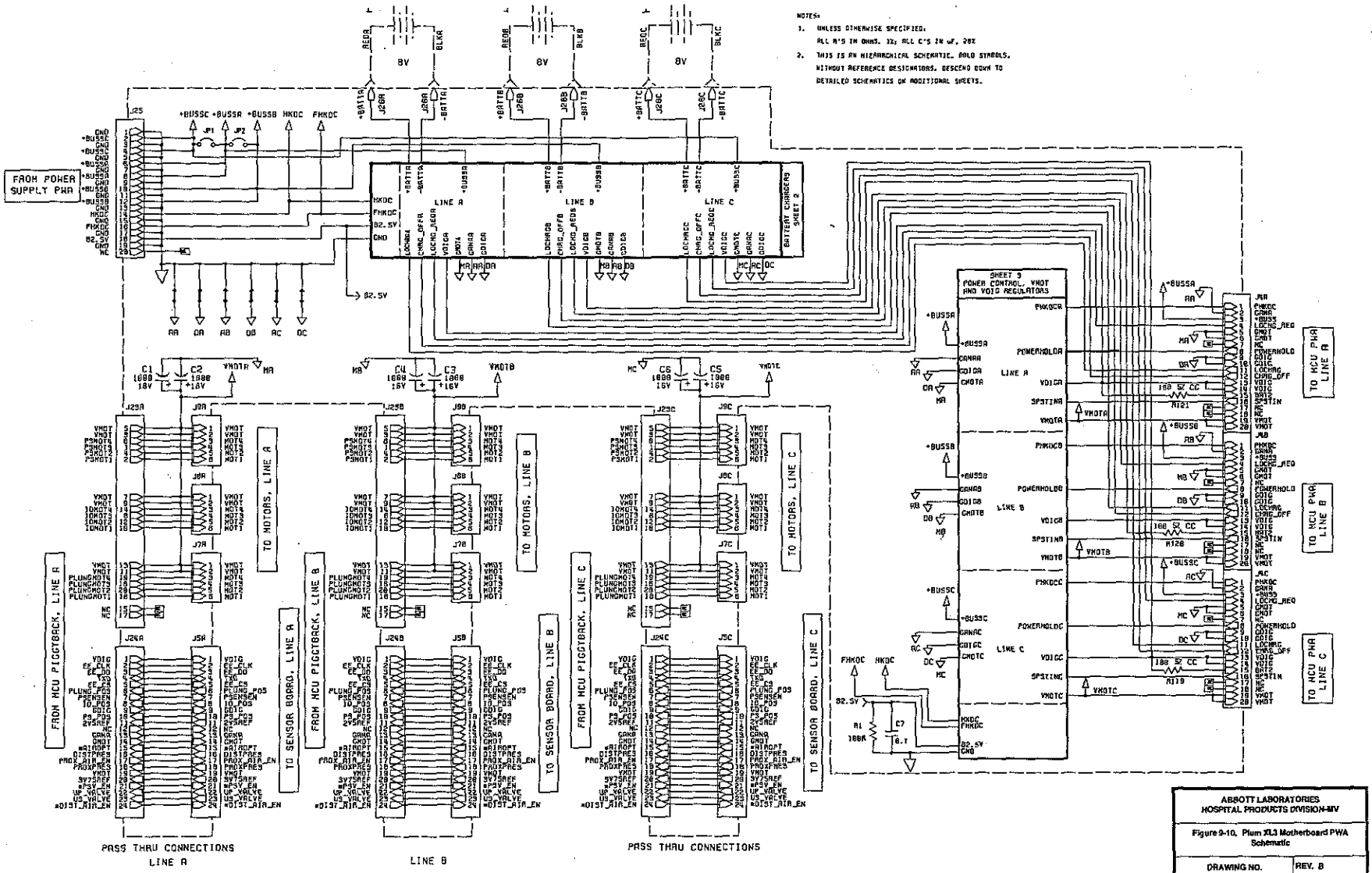
1. PROVISIONAL
2. UNLESS OTHERWISE SPECIFIED:
   ALL R'S IN OHMS, 1%, 1/8W, MF.
   ALL C'S IN uF, 20%, MONOBLOCK.
3. TP'S ARE PADS ON BOARD FOR GEN AND TEST.
   NO BOM PARTS EXIST.
4. R2 MAY BE REMOVED OR CHANGED TO 4.53K DURING MANUFACTURING TEST TO ADJUST SENSOR GAIN.



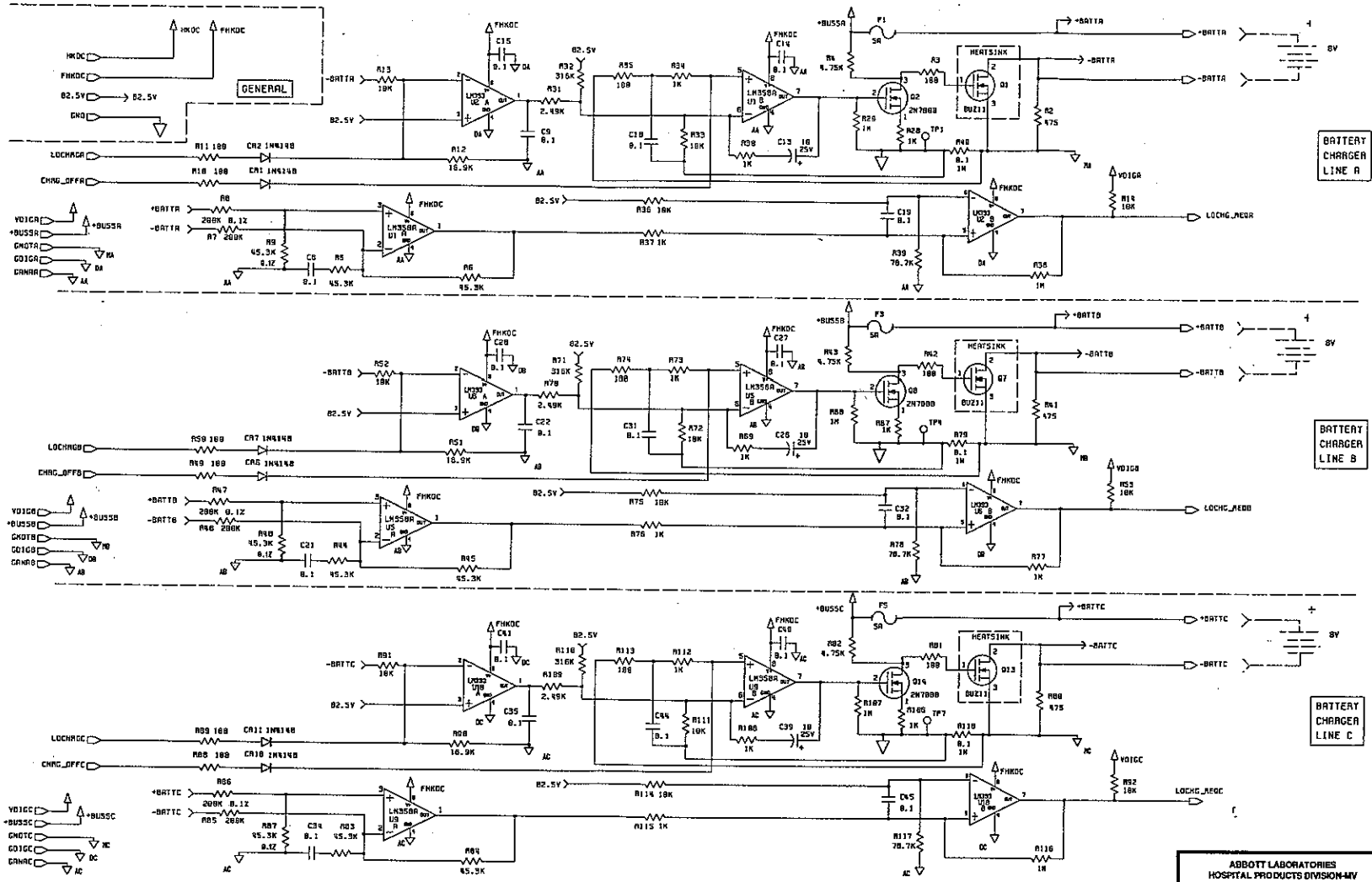
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-8. Plum XL3 Bubble Sensor PWA Schematic	
DRAWING NO.	REV. C
249-00536-002	SHEET 1 OF 1



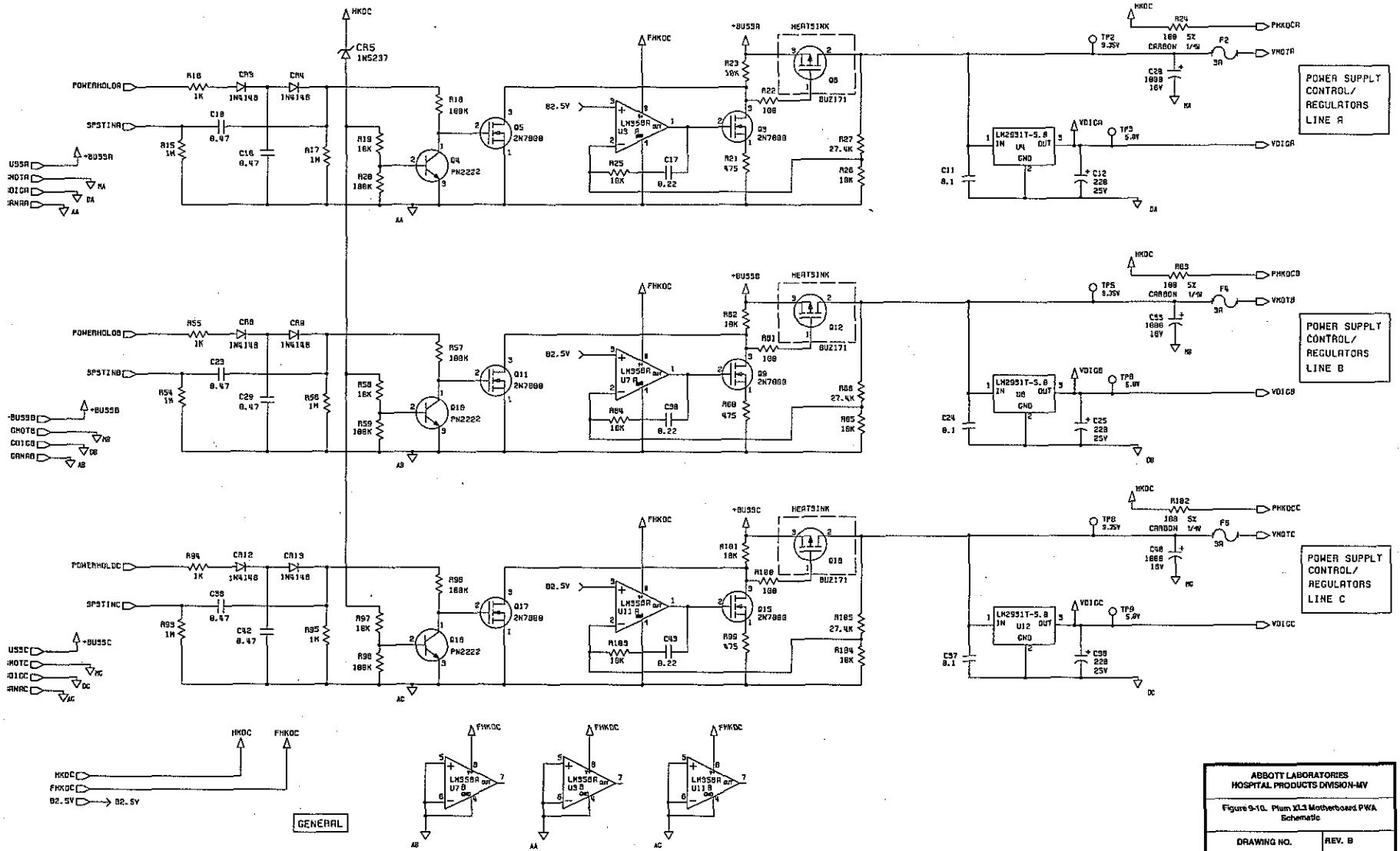
ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-9. Plum XL3 Pin Detector Flex Circuit Schematic	
DRAWING NO.	REV. B
249-00539-001	SHEET 1 OF 1



ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-10. Plum XL3 Motherboard PWA Schematic	
DRAWING NO.	REV. B
249-94016-004	SHEET 1 OF 3



ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
Figure 9-10. Plum XL3 Motherboard PWA Schematic	
DRAWING NO.	REV. B
249-94016-004	SHEET 2 OF 3



ABBOTT LABORATORIES HOSPITAL PRODUCTS DIVISION-MV	
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Mountain View, California 94043

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WARNING

POSSIBLE EXPLOSION HAZARD EXISTS IF INFUSION SYSTEM USED IN THE PRESENCE OF FLAMMABLE ANESTHETICS.

Patents pending.

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